WATER & SEWAGE WORKS

DEATH TO "FILTER FLIES"

Control definitely assured with

PENCO DDT

EMULSION CONCENTRATE

Now sewage works operators have a powerful and effective ally for controlling the "filter fly". PENCO Emulsion Concentrate, a specially compounded DDT product, destroys both adult flies and their larvae.

Recent tests have shown that DDT is effective against both the adults and larvae of certain common species of "filter flies" (*P. alternate and P. albipunctatus*). Applied in the form of a 5% DDT emulsion at an average of 1 p.p.m. to the sewage influent, it gave control of psychodid larvae on the trickling filter.

PENCO Emulsion Concentrate is the result of extensive Pennsalt field and laboratory work in cooperation with State and Federal Experiment Stations. A solution with organic solvents, it has a 34% DDT content, equivalent to 3 pounds of DDT per gallon. Packed in 5 gal. and 52½ gal. drums.

Write for pamphlet on "Control of Trickling Filter Flies with DDT".

PENCO

AGRICULTURAL CHEMICALS

AGRICULTURAL CHEMICALS DIVISION

PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

1000 WIDENER BUILDING • PHILADELPHIA 7, PA.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • CINCINNATI • MINNEAPOLIS • WYANDOTTE • TACOMA

WATER AND SEWAGE WORKS, August, 1946. Volume 93. Number 8. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year. Foreign, $3.00 per year. Entered as Second Class Matter, March 12, 1946, at the Post Office at Chicago, Ill., under act of March 3, 1879.

IS *Service* SIMPLICITY IMPORTANT TO YOU?

EMPIRE TYPE 14 METER UNIT ASSEMBLY

FEWER PARTS, BETTER DESIGNED PARTS,

All interior working parts are assembled as a complete unit without the use of screws before being placed in the meter casing.

Maintenance ease and economy are product qualities you can't readily see or appreciate. But these important advantages are present in every Empire Type 12 and Type 14 Meter—for they were designed that way. Speedy dismantling and assembly; fewer parts; exactingly interchangeable parts, all combine to make short work of meter shop operations.

In this design, the three interior castings that house the oscillating piston and intermediate gear train are assembled as a complete measuring unit before being placed in the meter casing. Fitting is quick and positive since mating casting joints are provided instead of interior screws that frequently cause binding or distortion. Empire construction assures a free running mechanism at the first assembly with all working parts held in perfect alignment.

The accuracy and durability of the Empire oscillating piston principle has been demonstrated for over 60 years. With service simplicity and maintenance economy as added features, today's Empire Meters are, more than ever before, the best measurement value ever offered.

EXACTINGLY INTERCHANGEABLE PARTS

Here are the parts of a completely disassembled Empire Type 12 (Frost-proof) Meter. This simple studied design presents many operational and service advantages.

EMPIRE *Oscillating Piston* METERS

PITTSBURGH EQUITABLE METER DIVISION

Rockwell Manufacturing Company
Pittsburgh 8, Pa.

BACKED BY MORE THAN A GOOD NAME!

RENSSELAER

Double Disc
GATE VALVE
Write for Bulletin X

Our Expert Field Representatives

bring Rensselaer's years of valve research and engineering "know-how" to your field of operations!

PROMPT ATTENTION

by the Rensselaer factory is assured whether you write, wire or phone a large order or a simple inquiry.

Enthusiastic SERVICE

Our Engineering staff gives efficient and cheerful attention to even the smallest valve problem.

Proven LONG-LIFE

Thousands of Rensselaer valves are in constant operation after service for over 60 years. What finer tribute could be given to Rensselaer's engineering knowledge, precision workmanship and quality materials?

Warehouse STOCKS

are normally maintained strategically throughout the U. S. to insure prompt delivery in every section of the country.

ATLANTA, GA.
17 Edgewood Ave., S.W.
BALA-CYNWYD, PA.
725 Kenmare Road
CHICAGO, ILL.
53 West Jackson Blvd.
HAVERHILL, MASS.
Haverhill National Bank Bldg.
LOS ANGELES, CALIF.
Subway Terminal Bldg.
MEMPHIS, TENN.
519 Farnsworth Bldg.
NEW YORK, N. Y.
50 Church St.
OKLAHOMA CITY, OKLA.
817 Braniff Bldg.
PITTSBURGH, PA.
2203 Oliver Bldg.
SAN FRANCISCO, CALIF.
115 Townsend St.
SEATTLE, WASH.
1252 First Ave., South
WACO, TEXAS
206 Franklin Ave.

PLEASE BE PATIENT. THE WIDE ACCEPTANCE OF OUR PRODUCTS HAS CAUSED SOME DELAYS IN DELIVERIES.

RENSSELAER VALVE CO.

TROY, N. Y.

maintains water pressure

DURING POWER INTERRUPTIONS!

Since a 500,000-gal. Horton elevated tank was installed as one of the improvements in the Laurel, Miss., water distribution system—pressure drops due to power failures or outages are a thing of the past. In addition, the elevated tank has resulted in more uniform pressures throughout the system (pressure formerly varied from 25 to 60 lbs. per sq. in.). Other improvements in the distribution system include a new 600-gpm well and 1,100 ft. of 16-in. main.

The distribution system now consists of 11,500 ft. of 12-in., 4,900 ft. of 10-in., 37,000 ft. of 8-in., 94,000 ft. of 6-in., and a small amount of 4-in. mains. The only storage facilities, aside from the new 500,000-gal. elevated tank, are a 100,000-gal. circular reservoir and a 500,000-gal. rectangular reservoir. The population of Laurel is estimated to be 31,500 (an increase of over 10,000 in four years) and the present area is approximately 3,000 acres.

For estimating figures on Horton elevated tanks, write our nearest office.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th Street
Atlanta 3.....2181 Healey Bldg.

Plants in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Washington 4.....703 Atlantic Bldg.
San Francisco 11.....1283-22 Battery St. Bldg.
Detroit 26.....1551 Lafayette Bldg.

In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

Mathieson ClO_2 = Good Water

In the summer of 1945, a destructive flash flood swept down the Lehigh Valley. It washed out a sewage disposal plant at the junction of the Lehigh and Delaware Rivers... caused the swollen Delaware to become heavily polluted.

In spite of this pollution, one community was still able to pump water from the Delaware and make it good to drink. This one town — Morrisville — had installed Mathieson's Chlorine and Chlorine Dioxide water treatment in April, 1945. When the flood came in July, Morrisville kept on pumping water and distributing it . . . *while other communities, not having the Mathieson treatment, were unable to make the water palatable.*

Thanks to the Chlorine and Chlorine Dioxide treatment, Morrisville's supply of good, safe water was never interrupted . . . and Mathieson added another interesting case history to its files.

Mathieson is proud to bring the benefits of this new Chlorine Dioxide technique to the nation's water works; its aim is to make this treatment available to every community troubled with water-supply taste and odor problems.

THE MATHIESON ALKALI WORKS (INC.)
60 E. 42nd ST., NEW YORK 17, N. Y.

Mathieson
CHLORINE DIOXIDE

CHLORINE DIOXIDE...SANITATION HTH...LIQUID CHLORINE...PH-PLUS (FUSED ALKALI)...CAUSTIC SODA...SODA ASH...BICARBONATE OF SODA... AMMONIA, ANHYDROUS & AQUA . . . CARBONIC GAS...DRY ICE...SYNTHETIC SALT CAKE...SODIUM CHLORITE PRODUCTS...SODIUM METHYLATE

Original Woodcut by Lynd Ward

When a growing community decides to construct a supply line to tap new sources of water supply, it plans for future as well as present needs. It is logical, therefore, that long-lived cast iron pipe should so frequently be given the preference over other materials, even at a higher first-cost. For this type of construction should be permanent construction. The pipe should be bought once, laid once, and cost little or nothing to maintain. U. S. Cast Iron Pipe, in supply line service, has been meeting these requirements for many years in all parts of the country.

U.S. cast iron PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

The New 2½" to 4" Geared Pipe Threader

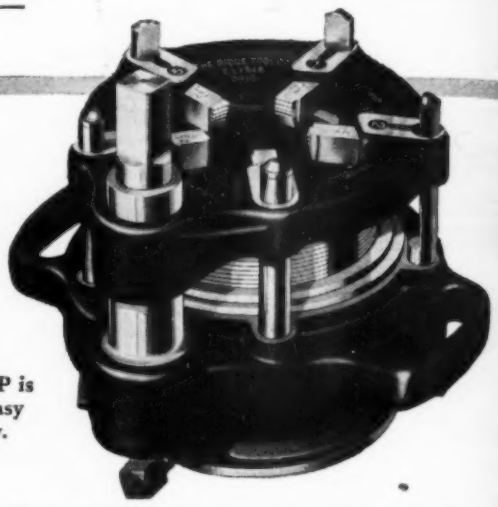
that's a lot easier to use

New RIDGID No. 4P

Balanced loop handles make new 4P extra easy to put on pipe.

● Surprisingly easy to handle — that's one big advantage you find RIDGID has engineered into this new 4P. Geared die stocks for 2½" to 4" pipe can't be featherweight but they can be far easier to use — and this one is. It gives you smooth perfect threads with least possible effort. Look, now —

New 4P is extra easy to carry.



New 4P has 5 chasers for smoother threading.

Quick-setting workholder sets to pipe size before putting on pipe.

Balanced Loop-handles. Easy to pick up, easy to put straight on pipe — no slipping or tipping over. And easy to carry with one hand. . . .

Quick-setting Workholder. Mistake-proof — you set it to size *before* you put it on pipe, then tighten only one screw. No bushings to bother with or lose. . . .

Easy Pipe Threading. Four sets of 5 high-speed steel dies easily cut clean accurate threads, standard or tapered, drip threads, short nipples. Ratchet handle with each 4P; RIDGID universal drive shaft available for power drive. . . .

Extra Easy Upkeep. Twin-anchored drive shaft turns in oil-less bronze bearing — never needs oil. Grease packed gear is fully enclosed, safe for you, safe from dirt and wear.

●

YOU'LL LIKE the new rugged steel-and-malleable 4P — it's a true worksaver RIDGID, precision made throughout — more for your money. Production still limited — see it at your Supply House.

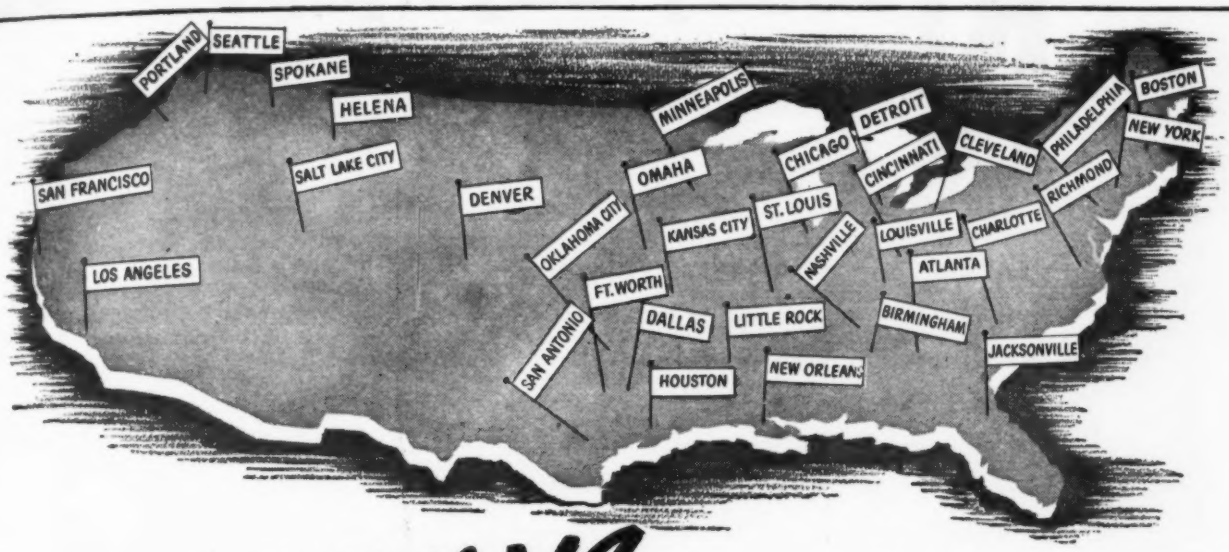
Millions of RIDGID Tools in use

★ RIDGID ★

WORK-SAVER PIPE TOOLS

The Ridge Tool Company
Elyria, Ohio, U. S. A.

GOVERNMENT-OWNED SURPLUS PROPERTY



33 BUYING SOURCES FOR INDUSTRIAL CHEMICALS

TYPICAL MONEY-SAVING BUYS

Acetone
Acids
Chlorinated Paraffine
(approx. 40% & 70%)
Gas cylinders (all types)
Hexachloroethane
Calcium carbide
Methyl bromide
Dyes
Plastic materials
Solvents
Sealing compounds
Petroleum catalysts
Activated charcoal
Silica gel
Calcium chloride
Strontium oxides
Dimethylaniline
Copper naphthenate
Synthetic & natural glues
Printing inks
(black & colors)
and most other chemicals

FROM acetone to xylol, the War Assets Administration is disposing of hundreds of surplus industrial chemicals at below market prices. To realize these savings for your business, write, wire or phone the nearest Regional Office, listed below, today. Items not available in your Region will be located for you through the special Inter-office Product Location service.

All items are being sold below current market price. Credit terms may be arranged. Make it *your* habit to check this source when your chemical stocks need replenishing.

All chemicals are subject to priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the WAA certifying office serving your area and then to purchase the material offered herein.

EXPORTERS:

Most surplus property is available to the export market. Merchandise in short supply is withheld from export and if such items appear in this advertisement, they will be so identified by an asterisk.

FREE FACTS

War Assets Administration (address nearest Regional Office)
Please supply, without obligation, prices, available quantities and locations of items written in below:

....
....
....
.....

Name.....

Firm.....

Address.....

City.....Phone.....

155-3

WAR ASSETS ADMINISTRATION

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Oklahoma City Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

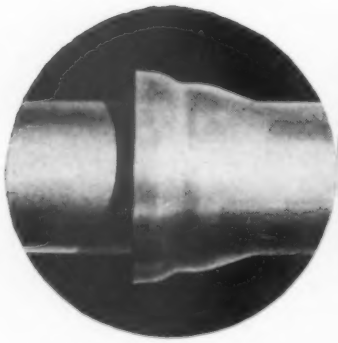
Nobody buys pipe JUST

You don't buy cast iron pipe just because it serves for centuries.

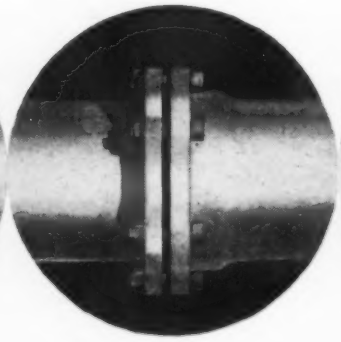
You buy cast iron pipe because the qualities that enable it to serve for centuries are also the qualities that mean day-by-day economy in the cost and operation of a water distribution system. *Qualities that result in lowest annual maintenance cost.* (Reports from 195 water works superintendents prove that the maintenance cost of cast iron distribution mains is far below that of other pipe materials.) *Qualities that result in lowest cost per service year.* (In 200 of America's largest cities, some or all of the original cast iron distribution mains are still functioning, after generations of satisfactory service.)

With long-lived cast iron pipe, you save money on maintenance—you save money by fewer street-openings and repairs—you save money by avoided replacements which would be necessary with shorter-lived pipe. The *present* generation of taxpayers gets the benefit of these economies, and is getting them *now*. Future generations will also benefit.

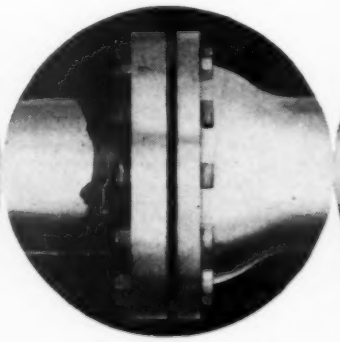
So, when we say "cast iron pipe serves for centuries" we do not say it all. Cast iron pipe not only serves but *saves* for centuries—through day-by-day economies in maintenance—through lower investment costs when evaluated in terms of useful life. Cast Iron Pipe Research Association, T. F. Wolfe, Research Engineer, Peoples Gas Bldg., Chicago 3.



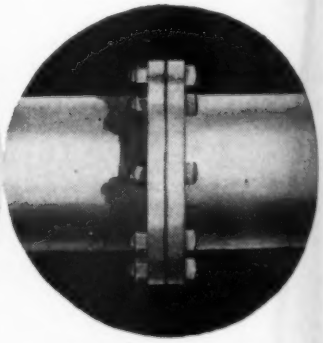
Bell-and-spigot joint—the time-tried and standard for water and sewerage service.



Mechanical joint—now standardized with interchangeable parts.



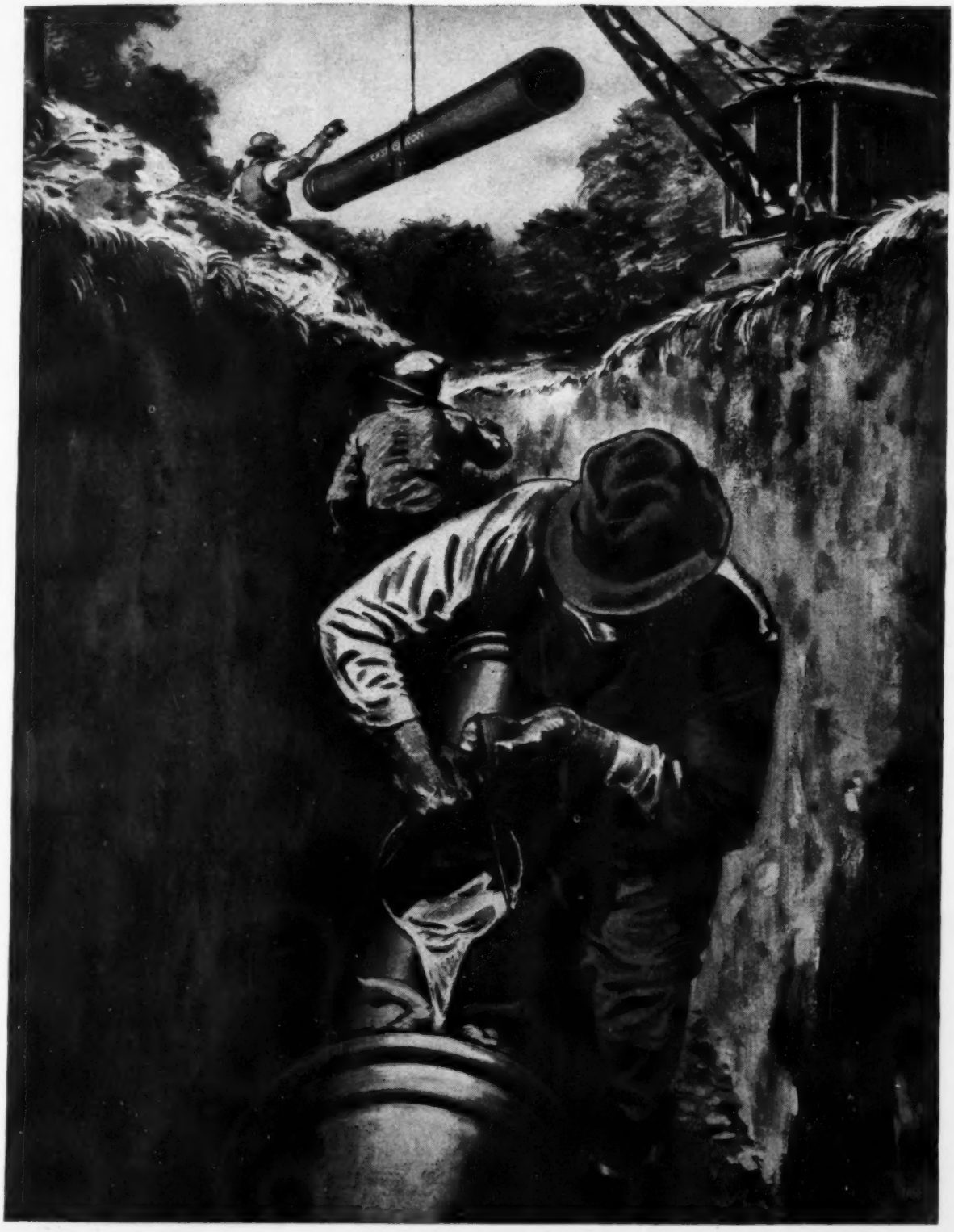
Flexible joint—for river crossings and other sub-aqueous installations.



Flanged joint—for water, steam, oil or gas lines, generally used above ground.

CAST IRON PIPE

BECAUSE it serves for centuries



Serves for Centuries

Rotovalves

by

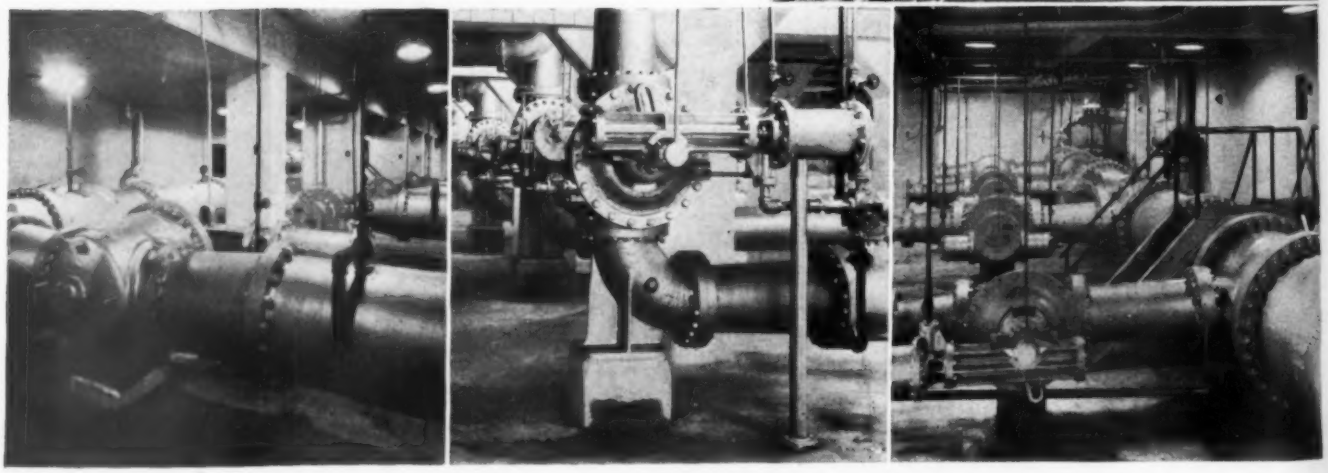
S. MORGAN SMITH COMPANY

In the Western Hills Booster Station • CINCINNATI

SETTING A STANDARD, Cincinnati's modern Station is frequently examined and studied as a "model" by interested Engineers and other Officials.

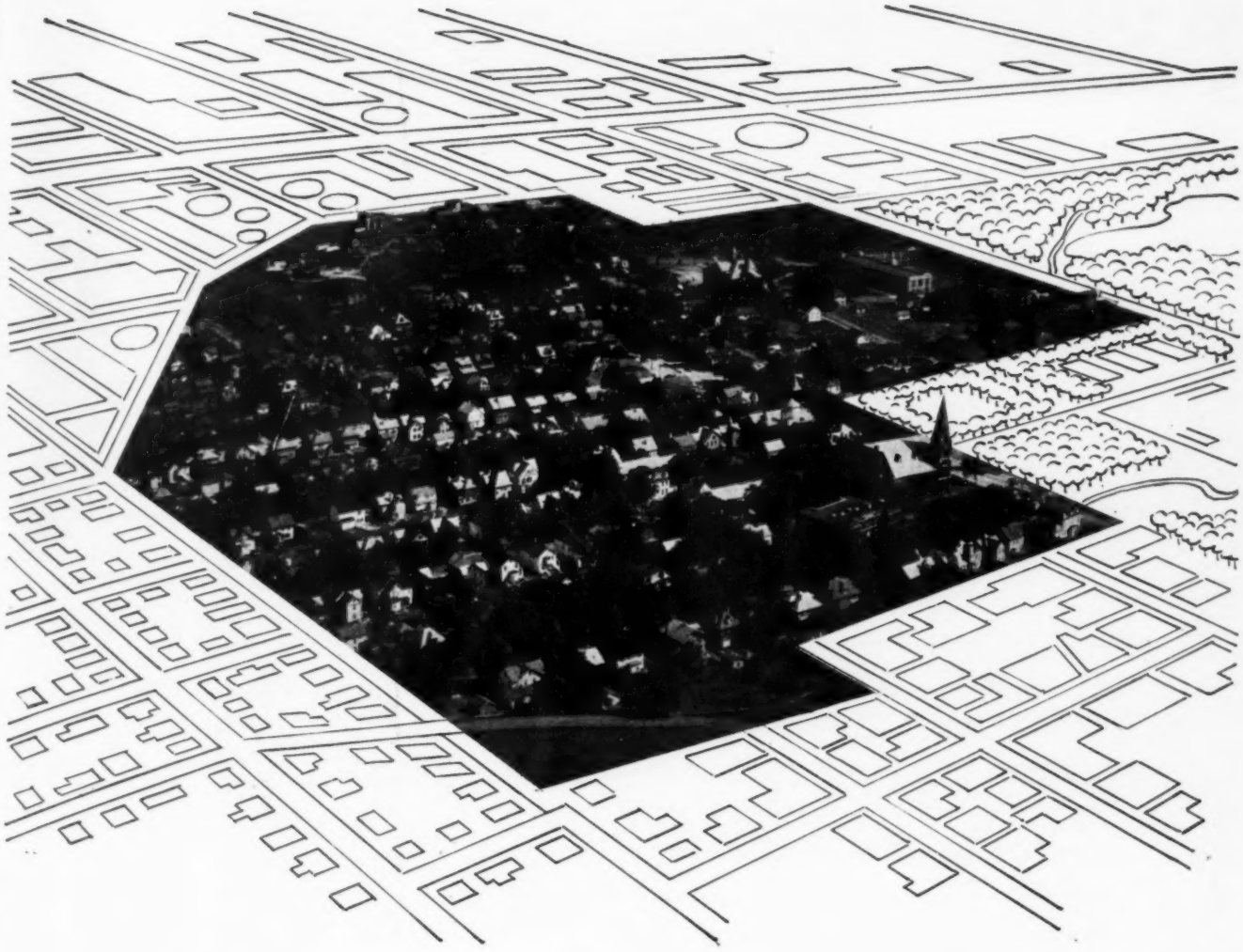
The pumping units, consisting of two 10 m.g.d., and two 7½ m.g.d. and one 5 m.g.d. pumps, are fully protected by S. Morgan Smith Rotovalves.

Among the unique features of this Station is the remote control of all valves from the operating panel.



S. MORGAN SMITH COMPANY

YORK • PA.



Will the water pipe you install today meet *TOMORROW'S* needs?

IF YOU are planning a water system to meet the expanding needs of tomorrow, it will pay you to give careful consideration to the pipe you install today. For not only the initial cost of the system, but even more important, *its operating economy in the long run,* may be at stake!

What will happen to water pressures and volume? Will they be sufficient for the community's future growth? Or—without resorting to larger diameter pipe than would otherwise be necessary in order to offset progressive reduction in rate of flow?

With Transite, you can select the minimum pipe size from the start—without allowance for reduced carrying capacity due to tuberculation. For Transite's initial high flow coefficient (C-140) can never be reduced by this costly form of internal corrosion.

What about pumping costs? Will your water lines develop "hardening of the arteries" in the years to come? Will tuberculation choke off delivery, increasing pumping costs and adding to taxpayers' bills? The answer is "no" if the pipe you install today is non-tuberculating Transite!

How about maintenance costs? Will you have to resort to periodic cleaning . . . lining your pipe . . . reinforcing it with additional mains . . . or even replacement to meet tomorrow's needs? In thousands of communities, tuberculation-proof Transite is helping to eliminate such maintenance costs . . . keeping water rates down . . . and providing important savings to taxpayers through the years.

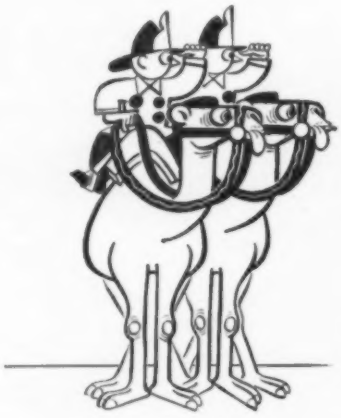
For all the facts, write for brochure TR-11A. Johns-Manville, Box 290, New York 16, N.Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

Transite Pressure Pipe

An Asbestos Product

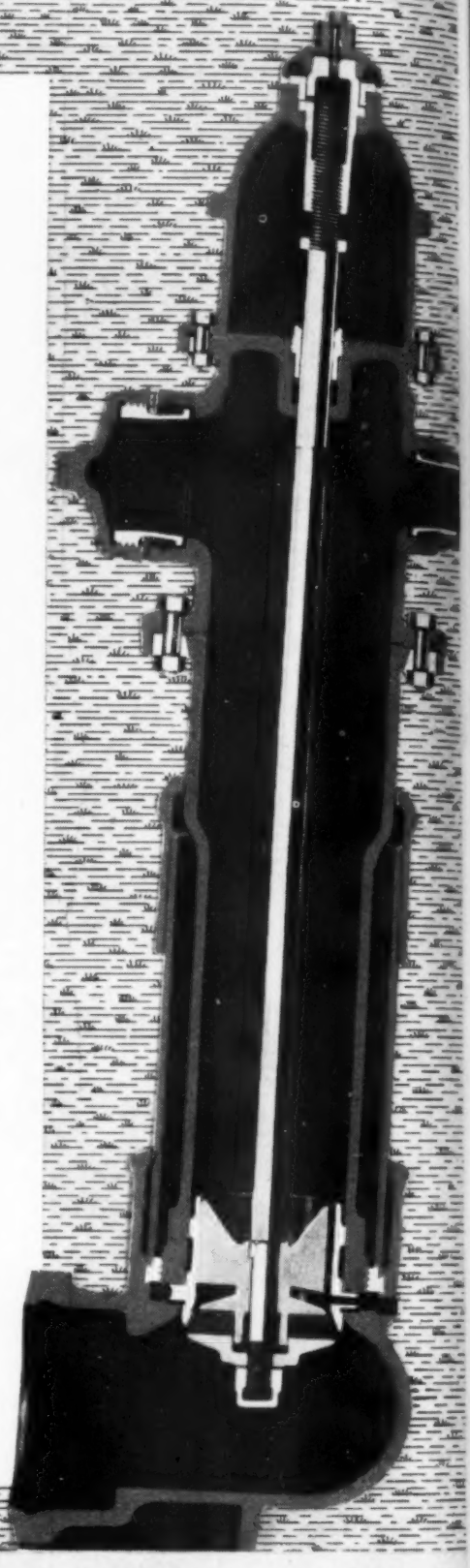


IT'S A DRY LIFE FOR THE MATHEWS THREAD

In any Mathews Hydrant the operating thread is permanently dry and dirt-free, a point we cannot overstress. The stuffing-box plate is so designed as to prevent contact between the thread, and water in the hydrant. As for rain, that is kept out by means of an iron shield capping the bronze revolving nut. This cap also excludes sand, dust and dirt. The result is an operating thread that can be depended on to work perfectly.

In case of damage, a Mathews Hydrant is quickly restored to service, for all the working parts are contained in a removable barrel. A spare barrel, a lug wrench, a few minutes' work, and the hydrant is working again. This is protection *plus* economy.

A hydrant so superior might be expected to be widely favored. That is the actual case, and today there are some 400,000 Mathews Hydrants in use, everywhere in the world.



MATHEWS HYDRANTS

Made by **R. D. WOOD** *Company*

PUBLIC LEDGER BUILDING.
INDEPENDENCE SQUARE, PHILADELPHIA 5, PA.

MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

ROUGHT IRON

The ventilating ducts used to carry off the moist, gas-laden air from sewage treatment operations must be prepared for trouble . . . or they will surely have it.

Some of these gases, when absorbed by the moisture, form aggressive acids which attack and speedily penetrate vulnerable materials. It is generally impractical to do anything about the corrosive character of the mixture, so that the only practical protection is to use a durable material.

In this, as in dozens of other corrosive services around the treatment plant, Byers Wrought Iron has been widely used, and has proved highly dependable. The illustration shows a duct installed in the building where screening and grit removal is handled, in one of the largest treatment plants built in recent years. This duct was fabricated of Byers Galvanized Wrought Iron.

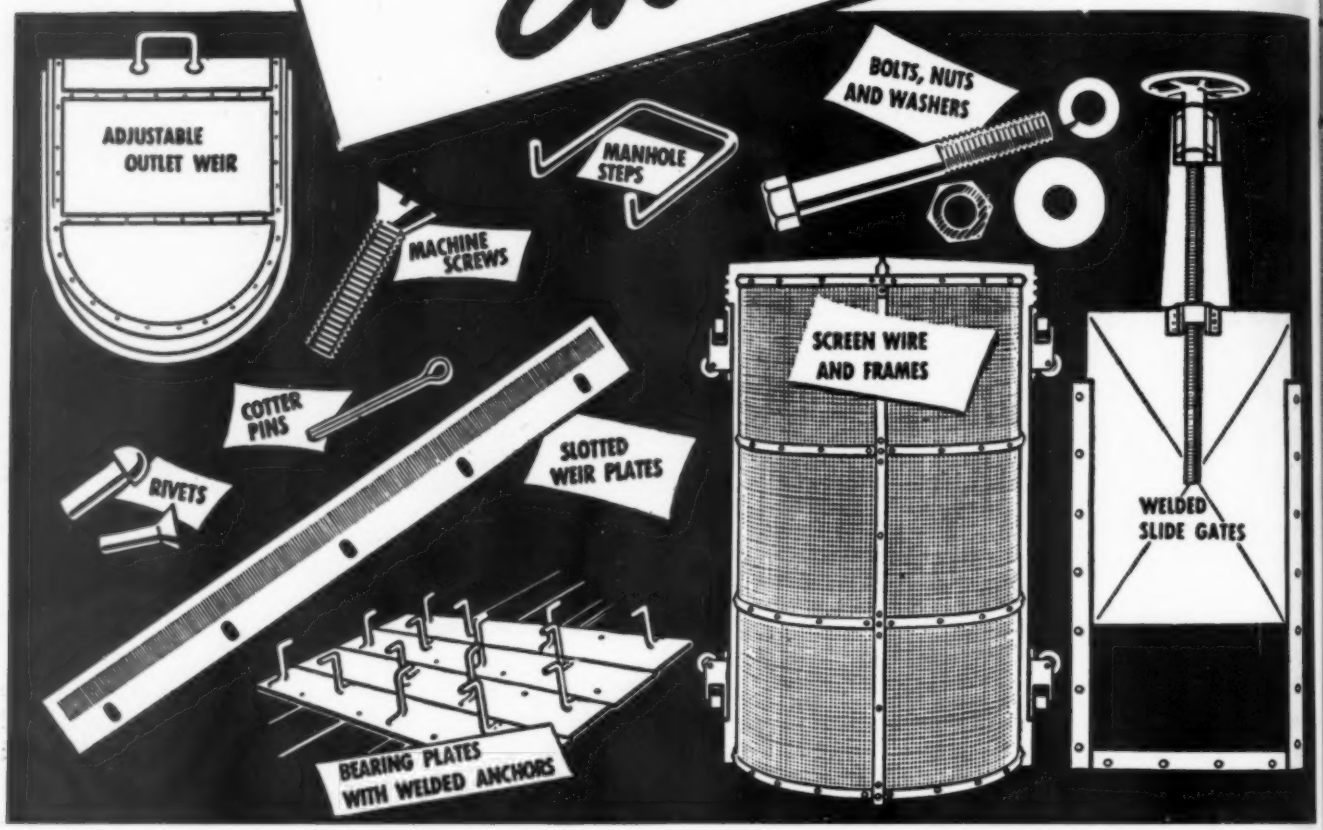
The reason that Byers Wrought Iron resists corrosion so successfully is found in its unusual structure and composition, which are duplicated in no other material. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and diffuse corrosive attack, and so discourage the local pitting and rapid penetration that causes ordinary materials to fail prematurely. The fibers also help to anchor the initial protective scale, which shields the underlying metal. The corrosion resistance of wrought iron does not rely on surface coatings, but when galvanizing is desired, the microscopically rougher surface of the material helps it to take and retain a heavier coating.

If you are concerned with the repair of existing sewage plants or the construction of new ones, you will find some helpful information in our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations." May we send you a complimentary copy?

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

Light weight...Long life
Combined in equipment of
Everdur



HIGH STRENGTH, good welding characteristics and corrosion resistance equal to that of copper . . . this is the useful combination of properties offered by Everdur*. Because of these properties, Everdur is widely used for sewage treatment and waterworks equipment of light weight or welded construction. The durability of Everdur under corrosive conditions is attested by installations still giving dependable service after 18 years.

Available in practically all commercial shapes, Everdur Copper-Silicon Alloys are readily fabricated. For detailed information, write for Publications E-11 and E-6.

46211

*Reg. U. S. Pat. Off.

EVERDUR is widely used for:

Coarse and Fine Screens, Float Chambers, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Pipe, Ladders, Float Gage Chains, Valve Springs, Guides, Walkways, Electrical Conduit, Flashboard Supports, Flush Box Fittings, Spillway Fittings, Valve Stems.

ANACONDA

Everdur

COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

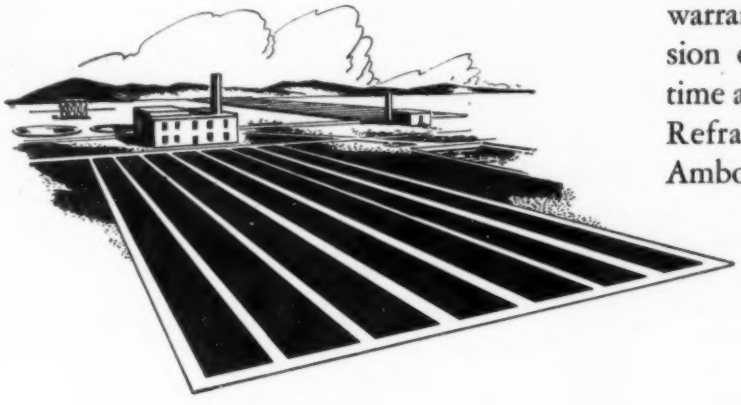
DIFFUSER INSTALLATION in Channel Aeration

THE advantages of aeration in channels conducting sewage and mixed liquor are well known in the field of sanitation. By preventing settling and accumulations... by maintaining an evenly distributed flow to tank inlets... by helping avoid septic conditions—this modern practice definitely increases plant efficiency.

At the same time, conditions peculiar to particular installations present problems in choosing the most efficient diffuser equipment. The efficiency of the entire system depends on the correctness of this choice. Variables must be accurately estimated for each application. Channel design and velocities are two factors which engineers and designers must consider.

With experienced understanding of the specialized character of diffuser applications—our engineers are ready to lend a hand in their proper selection and installation. By sitting down with design consultants, superintendents and contractors, they are able to offer specialized information and advice... often help reach practical decisions in less time. For their suggestions are based on daily experience in a wide variety of sewage and sanitation applications.

The many variables of diffuser requirements warrants calling in these engineers. A discussion of problems can readily result in saving time and trouble. The Carborundum Company, Refractories Division, Dept. O-86, Perth Amboy, New Jersey.



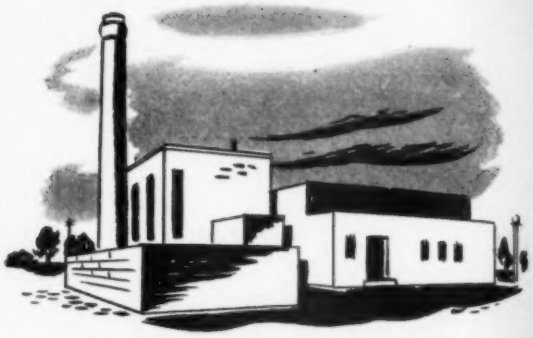
DIFFUSER MEDIA

BY CARBORUNDUM

TRADE MARK

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

THERE ARE 3 WAYS TO GET RID OF SLUDGE

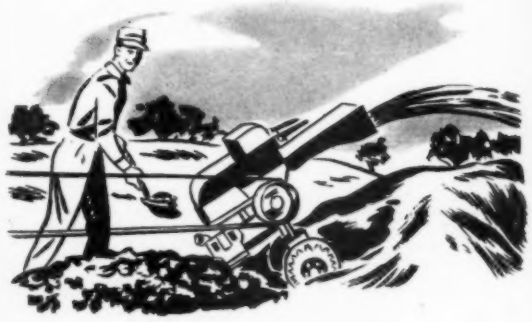


YOU CAN INCINERATE IT

Burning sludge involves a capital investment, maintenance of the equipment, and the cost of transporting the sludge to the incinerator—all without any return.

YOU CAN BURY IT

This method involves considerable labor, purchase or lease of land, and in many cases difficulty in finding a place where it is permissible to bury sludge. Here again there is no return.



YOU CAN CONVERT IT INTO FERTILIZER

as is being done in the view above at the Madison, Wisc. Sewage Plant, by means of a Royer Sewage Sludge Disintegrator. This method requires no more labor than burning or burying the sludge and provides a source of substantial revenue.

THE ROYER CHANGES SLUDGE DISPOSAL COST INTO PROFIT

There's high fertilizing value in sewage sludge, and properly prepared it is in demand among growers of food crops—from home gardeners to the largest commercial growers. Park commissioners and greenskeepers also demand it.

Sludge cake as it comes from the drying bed is not in shape for effective use as a fertilizer—but here's where the Royer comes into the picture.

This rugged, inexpensive machine can be operated by one man—just shovel the sludge cake into the hopper. The Royer thoroughly shreds, mixes, aerates and further dries the sludge, removing trash and discharging onto pile or truck an effective, ready-to-use fertilizer.

Twelve Royer models—electric motor, gasoline engine and belt-to-tractor driven. Write for our "Sewage Sludge Utilization Datalog."

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

Highly essential are the diversified uses of carbonate of potash. In many types of products it provides a quality or combination of qualities that make for complete effectiveness and basic value. Among such products are glass and ceramics, soaps, fertilizers, tanning materials, chocolate "dutching" processes, engraving and lithography. As the pioneer producer of carbonate of potash in this country and for several years the only American producer, Niagara offers you the benefits of experienced counsel and advanced knowledge in using carbonate of potash to obtain the most economical and satisfactory results.

An Essential Part of America's Great Chemical Enterprise

Niagara Alkali Company

CAUSTIC POTASH • CAUSTIC SODA • PARADICHLOROBENZENE • CARBONATE OF POTASH • LIQUID CHLORINE • NIAGATHAL

60 EAST 42nd STREET • NEW YORK 17 N. Y.

In the good old summer time —

For millions of Americans, young and old, sunny skies and balmy weather are synonymous with the pleasures of swimming . . . the relaxation of a cooling dip, or the exhilaration of a fast crawl.

Columbia products help to keep swimming the grand care-free recreation it is. Pittchlor* rids captive water of dangerous bacteria, keeps locker rooms, showers and other facilities free of infection . . . just as Pittchlor and Columbia Liquid Chlorine are used to assure pure drinking water for millions *every day.*

*PITTCHLOR—a 70%, high-test calcium hypochlorite of good stability in the form of dry, white granules—is a convenient way to put chlorine to work for disinfecting, deodorizing, sterilizing and bleaching. Used by food plants, dairies, laundries, sewage plants, etc., or wherever the oxidizing power of chlorine is desired.

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION

FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PENNA. · Chicago · Boston · St Louis
Pittsburgh · New York · Cincinnati · Cleveland · Philadelphia · Minneapolis · Charlotte · San Francisco

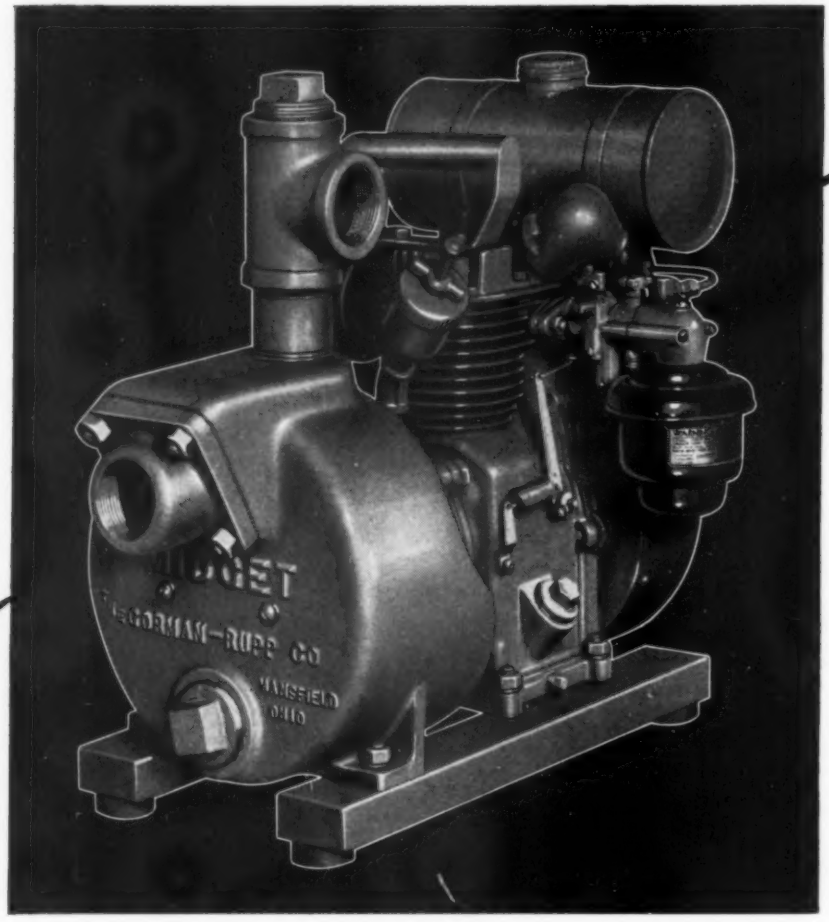
COLUMBIA ESSENTIAL INDUSTRIAL CHEMICALS

Soda Ash · Caustic Soda · Liquid Chlorine · Sodium Bicarbonate · Pittchlor · Silene EF (Hydrated Calcium Silicate) · Calcium Chloride · Soda Briquettes (Iron Desulphurizer) · Modified Sodas · Caustic Ash · Phosflake (Bottle Washer) · Calcene T (Precipitated Calcium Carbonate)

PUMPS MORE WATER

per pound of pump

and at Less Cost of Operation



The Gorman-Rupp "Midget" pump will handle 3000 gallons per hour, 400 times its own weight in water every hour at average heads. It is easily carried from one job to another as it weighs only 60 pounds.

Not only will the "Midget" handle more water per pound of pump but will do it at less cost in power, fuel and maintenance. It is not uncommon for a Gorman-Rupp pump to run 60 days or more without interruption. It is the simplest centrifugal pump built – rugged, reliable, efficient. It is automatic self-priming and non-clogging – any muck or solids that will pass the intake strainer will clear the pump with no damage to the mechanism.

There is a size of Gorman-Rupp self-priming centrifugal pump to handle any pumping problem. Other models will handle capacities up to 125,000 gallons per hour.

Ask our nearest distributor for a Gorman-Rupp pump. Try it on the job. If it doesn't do a better job than any pump you have seen, return it at our expense.

For details call your nearest distributor.

THE GORMAN-RUPP COMPANY

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST

327 Bowman Street **Mansfield, Ohio**

4 reasons

why water supply systems use **CALGON***

1. Calgon controls corrosion
2. Calgon stabilizes water following lime softening
3. Calgon prevents scale formation on heating
4. Calgon prevents precipitation of dissolved iron from well waters

—and in all of these uses, Calgon requirements are only a few parts per million.

See the Calgon reference and data page in this section; write for full information concerning your specific problems.

*T.M. Reg. U.S. Pat. Off.

HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.

Will tomorrow's cities be odorless?

EVEN today, science works such miracles that we may confidently expect familiar "city smells" to be eliminated in the future.

Smoke and noxious fumes from trains, ships, factories, automobiles, and other sources, will probably be deodorized or banished as a result of continued research.

Another source of odors—one of the most widespread and offensive of all—is garbage. But, fortunately, the means for eliminating its stench is already at hand. This is accomplished by a revolutionary advance in the method of disposing of the garbage itself.

As an authority in the field of sanitation, you will be particularly interested in this new method. For it involves *the combining of food wastes with human wastes in existing sewer systems.* And the device which makes this possible is the General Electric Disposall*—a kitchen appliance which grates food wastes into fine particles and flushes them into the sewer system, *without affecting present sewage works practices!*

Thus, by recognizing this trend in sanitation, you can do much to "clean the air" for future citizens of your community.

But garbage does not merely offend people's nostrils. *It menaces their health.* And you, who have done so much to help check once-common diseases by providing for the safe removal of human wastes, will surely have a vital interest in helping to control this other danger.

Here are further facts showing how the Disposall can definitely eliminate both the odors and the dangers of exposed food waste:

QUESTIONS AND ANSWERS ABOUT THE DISPOSALL METHOD OF REMOVING FOOD WASTE

1. Has the Disposall been tested?

Yes—*thoroughly.* It has been subjected to experiments in numerous research laboratories. And it has been installed in several hundred communities where it has proved its efficiency in actual use for more than ten years. All tests show that the Disposall offers a practical way to dispose of food wastes.

2. Will Disposalls cause sewer system stoppages?

No. When food wastes are Disposall-treated, they enter the sewer system as finely grated particles which flow freely through the pipe lines without shoaling or settling.

Although similar to human wastes and other solids now flowing through your lines, Disposall-processed food wastes are smaller, more water-buoyant and uniform in character. The wastes are ground in a controlled amount of cold water which congeals and homogenizes greases into a form which will not clog sewer lines.

3. Why should food waste be removed immediately?

Because, like human waste, food waste is organic matter —odorous and putrefactive—a dangerous source of disease, because it attracts germ-spreading flies and rodents.

The outhouse of yesterday has vanished. So should the garbage can. For now, with the Disposall, food waste can be removed *immediately.*

4. Will you have to expand your plant's capacity?

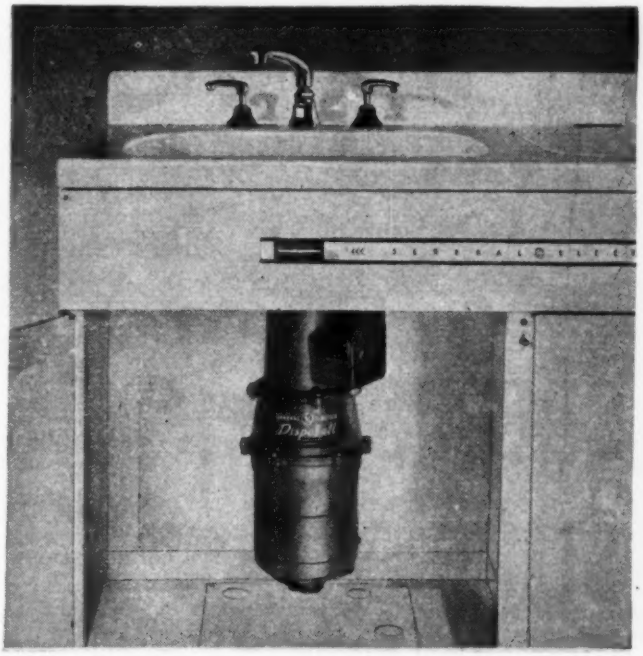
It will be many years before the number of Disposalls in your community will increase the loading on the treatment plant appreciably. Even if every home used a Disposall, the volume of sewage flow would be increased less than 2 per cent. Naturally, the addition of food wastes to the sewage flow will increase the solids and organic loading on the plant. Many plants can handle this increased loading for a number of years; others can be expanded, some years hence, when required.

5. Are sewage treatment plants needed?

As a health-protective measure, there can be no question about the need for treatment plants, whether there are Disposalls in the community or not. We hope that the Disposall will provide another incentive for building treatment plants wherever they are now needed.

6. Is more information available?

Yes! Further details about the Disposall are yours for the asking. Also, we will be glad to answer any specific questions you may wish to ask. Please write to Department WSW846, General Electric Company, Bridgeport 2, Connecticut.



The G-E Disposall shown installed in the G-E Electric Sink. Food wastes are scraped into drain opening and safety cover placed in position. Cold water tap is then turned on, starting the Disposall operation. Food waste is grated and flushed away automatically.

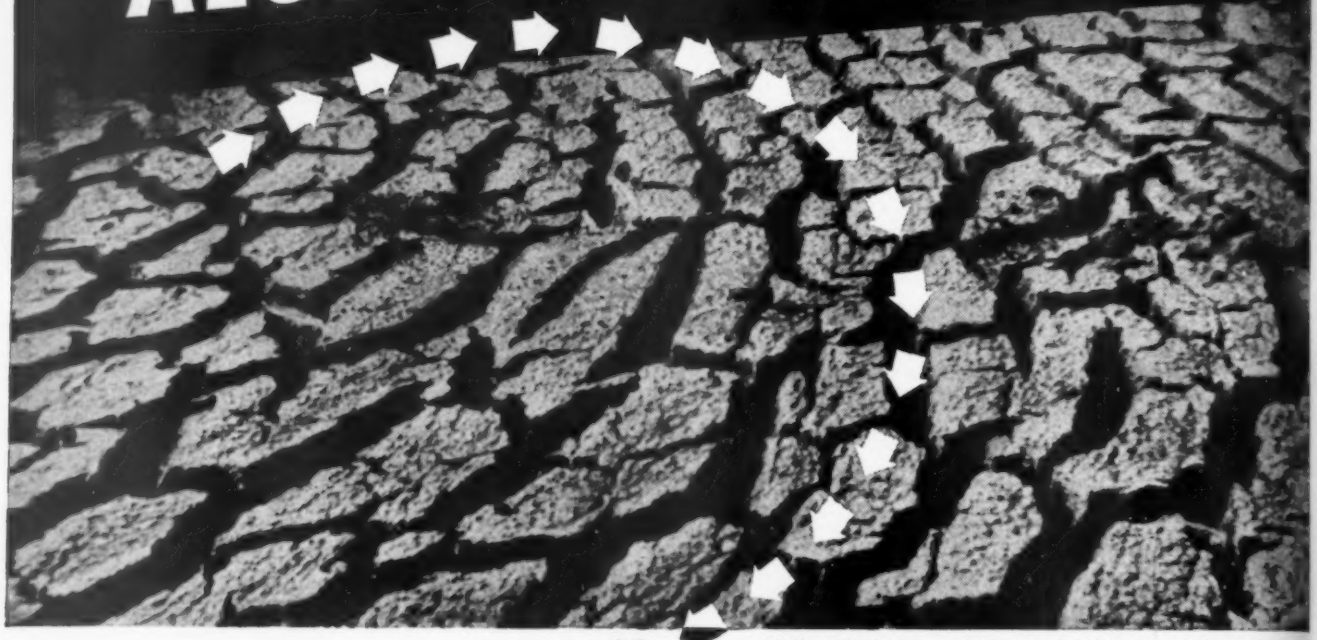
Disposall

*TRADE-MARK REG. U. S. PAT. OFF.

CONVERTS FOOD WASTE TO SEWAGE—ELIMINATES "GARBAGE"

GENERAL ELECTRIC

GENERAL CHEMICAL ALUMINUM SULFATE



Well cracked sludge bed shortly after Aluminum Sulfate treatment.

SPEEDS SLUDGE DRYING

General Chemical Alum speeds sludge dewatering and drying on sand beds... capacity of beds may be doubled, even tripled . . . quick removal lessens chance of odor nuisance . . . reduced volume of cake decreases cost of removal. Sewage works operators the nation over count on the benefits obtained from Alum treatment throughout the year.

Why not learn what General Chemical Alum will do in your plant too? Full information may be obtained quickly from the nearest General Chemical Sales and Technical Service Office listed below.

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh Providence (R. I.) • San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee & Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

HOW PASSAIC VALLEY WATER COMMISSION *MAINTAINED SERVICE*

While Inserting Valve in Large Asbestos-Cement Main

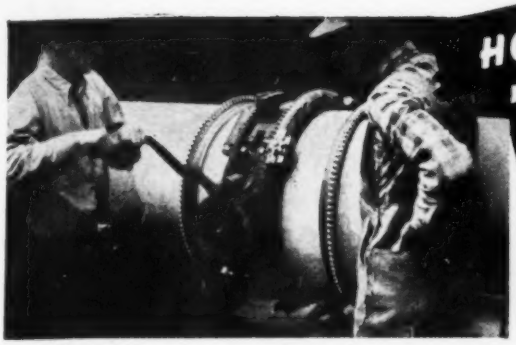
THE PROBLEM

To insert a gate valve in a 24" asbestos-cement main without interrupting water supply.

THE SOLUTION

Engineers of The A. P. Smith Mfg. Co. were asked if it were possible to make a valve insertion under pressure in a large asbestos-cement main. They answered in the affirmative and performed the job without a hitch, employing a standard Smith Inserting Valve and Machine.

HOW IT WAS DONE

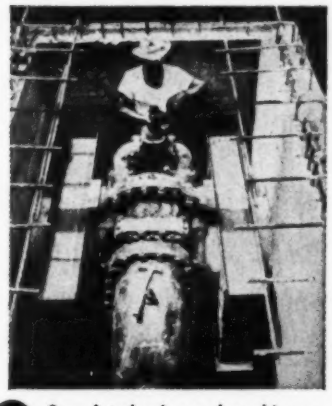


1 Making initial cut partially through pipe wall.

2 Half of valve body in place. Seat rings can be seen on each side of pipe-cutting mechanism.

3 Halves of valve body and slide gate in place.

4 Temporary bonnet attached to valve body; cutter is actuated by revolving the rod extending through stuffing box. Cut-out pipe section is withdrawn into bonnet and slide gate is closed, allowing removal of temporary bonnet and cut-out pipe section.



5 Completed valve anchored in concrete valve chamber.

Note: Valve insertions can be made in cast iron, steel or asbestos-cement pipe in sizes 4" through 48".

10

FIRE HYDRANTS
GATE VALVES
CHECK VALVES
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.

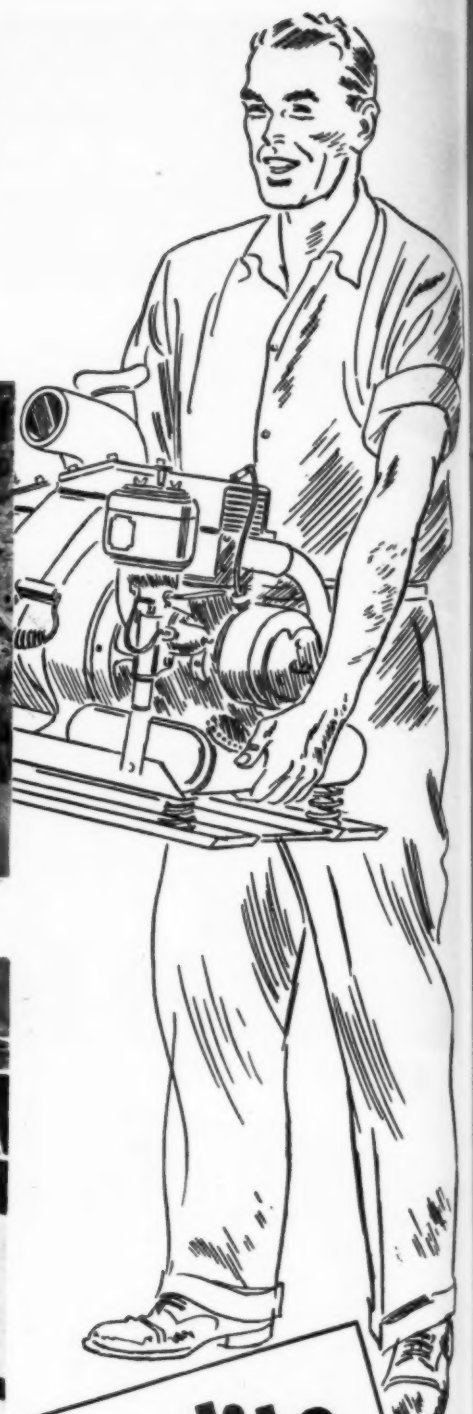
EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

Put These Pictures *into ACTION*

Above — Pump out water faster . . . handle heavy liquids and solids easier . . . with a fast self-priming Homelite Portable Pump.

Below — Operate electric tools . . . saws, grinders, drills and many others . . . with a Homelite Portable Generator. Use it also for floodlights on night jobs.



Do you want to see these pictures come to life? Do you want to see how you, like thousands of others, can cut operation costs . . . get more work done in less time . . . with Homelite Portable Gasoline-Engine-Driven Pumps and Generators?

Then write, *now,* and ask us to have a Homelite Representative arrange to give you a free demonstration. Without obligation to you in any way, he'll show you, *right on your job,* Homelite Portable Pumps and Generators *in action.* You ask him questions. Run the units yourself. You can find out everything you want to know about their design and operation. You can see, for yourself, just what you can expect in on-the-job performance. Write today.

Homelite
CORPORATION
Port Chester, New York
Portable Pumps Generators and Blowers
GASOLINE-ENGINE-DRIVEN

How much is waste costing in YOUR plant?

Here's how you can reduce it with BECKMAN pH CONTROL

IN industry after industry Beckman pH Control is reducing costs, minimizing waste, saving time and greatly increasing production efficiencies. Have *you* investigated what this amazing new profit tool can do in your plant? *Wherever there's water, there's pH.* So if you use water or water solutions of *any* kind... whether in pulps, liquids, or semi-solids—in process solutions, waste disposal or any other way ...chances are that Beckman pH Control can help you do the job better—*for less.* Here, for example, is how others are slicing costs with Beckman equipment...

BECKMAN IS THE ONLY HIGH TEMPERATURE—HIGH pH EQUIPMENT

★ An important point to remember when installing pH control in your plant is that there is only ONE make of modern glass electrode pH equipment which can be used *continuously* in high temperature solutions. Even in boiling hot solutions, Beckman *High Temperature Glass Electrodes* give uniform accuracy and long life. This advancement is particularly useful in many food processes...in boiler feedwater conditioning... and in a wide range of chemical processing operations.

★ Beckman is also the *only* modern glass electrode equipment with which you can make high pH measurements *even in the presence of sodium ions*... a development that has extended the usefulness and accuracy of the glass electrode to many new industries where alkaline solutions, in combination with sodium ions, heretofore presented difficulties. A few of the many fields in which this Beckman development has proved indispensable include soap making, the manufacture of bleaches, detergents, etc.

SAVING CHEMICALS: By Beckman-controlling processes where chemicals are used, operations can be controlled so closely that overdosage and excess use of chemicals can be practically eliminated. Not only does this cut chemical costs, but it also assures more uniform processing, more accurate production control and greater plant efficiency.

REDUCING CORROSION: More and more plants are discovering the many advantages of reducing corrosion with Beckman pH Control. By Beckman controlling-process operations, these operators are able to regulate acidity and alkalinity—and thus neutralize excessively corrosive solutions before they damage costly plant equipment.

MINIMIZING REJECTS: Beckman pH Control is also making important savings by assuring more uniform quality of production. In many operations only a small change in pH makes a great difference in operation of the processing solutions. By Beckman-controlling the solutions, run after run is processed with identical quality, thus reducing rejects, cutting production costs and making greater savings in over-all efficiency.

SAVING TIME: Just as heat can frequently speed up chemical processes, so proper pH control can often save on processing time. Here again, even a relatively small saving on each production run quickly builds up to tremendous over-all savings in labor and plant overhead.

WHEREVER THERE'S WATER, THERE'S pH!

Let our engineering staff study *your* particular pH problem and make recommendations on the type of equipment best suited to your requirements. No obligation, of course.

For helpful information on pH control, send for this free booklet "What Every Executive Should Know About pH!"

BECKMAN

BECKMAN INSTRUMENTS • NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA 20 CALIFORNIA

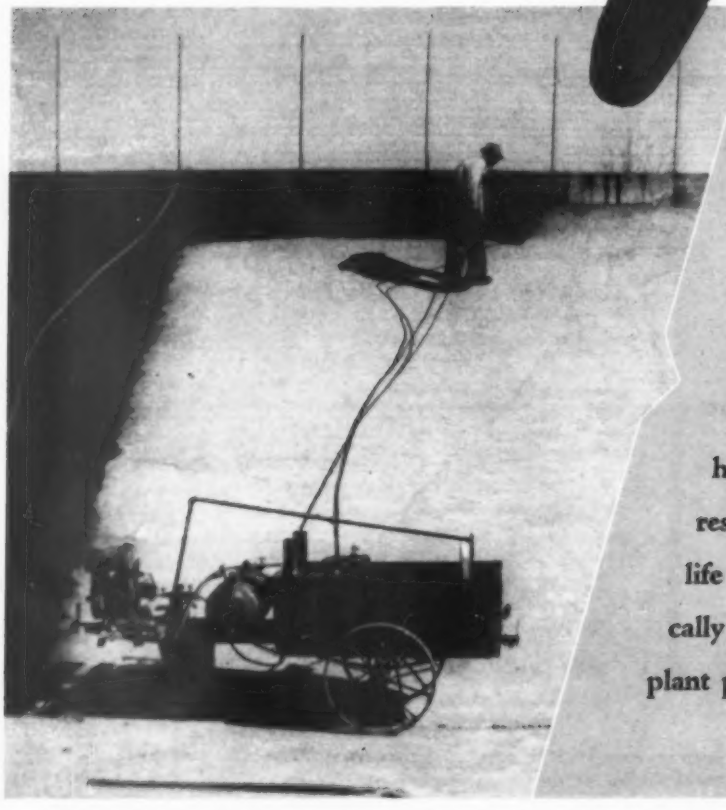
INSTRUMENTS CONTROL MODERN INDUSTRIES

NO-OX-ID
IRON + OX = RUST
REG. TRADEMARK
AUG. 27, 1918

PUT YOUR FINGER

ON WASTE SEEPAGE

plugs Leaks due to Checks and Spalls



All surfaces submerged or exposed to weather should have a protective coating—on steel to prevent corrosion—on concrete to stop cavitation, leaching, and spalling. NO-OX-ID is built for this use. Applied hot it gives an intimate and lasting bond with no pin holes or holidays. NO-OX-ID is tough, resilient, and will not crack or peel—long life expectancy. Can be applied economically with your regular plant personnel.

NO-OX-ID
IRON + OX = RUST
REG. TRADEMARK
AUG. 27, 1918

The ORIGINAL RUST PREVENTIVE

Dearborn Chemical Company
Dept. Y, 310 S. Michigan Ave., Chicago 4, Ill.
New York, Los Angeles, Toronto

IS GARBAGE AND RUBBISH DISPOSAL A PROBLEM IN YOUR COMMUNITY?

Do the job right!

WITH MODERN, EFFICIENT, HIGH TEMPERATURE

Incinerator Plants by PITTSBURGH • DES MOINES

Complete, odorless incineration of refuse is achieved by Pittsburgh-Des Moines *High-Temperature* Incinerator Plants, in types and capacities serving the needs of village or metropolis. Correct combustion principles and design flexibility adapt these units for the disposal of all mixtures of garbage and burnable rubbish peculiar to any locality, as well as combination refuse and sewage plant sludge incineration. Performance is guaranteed—consult with our engineers on your particular requirements!

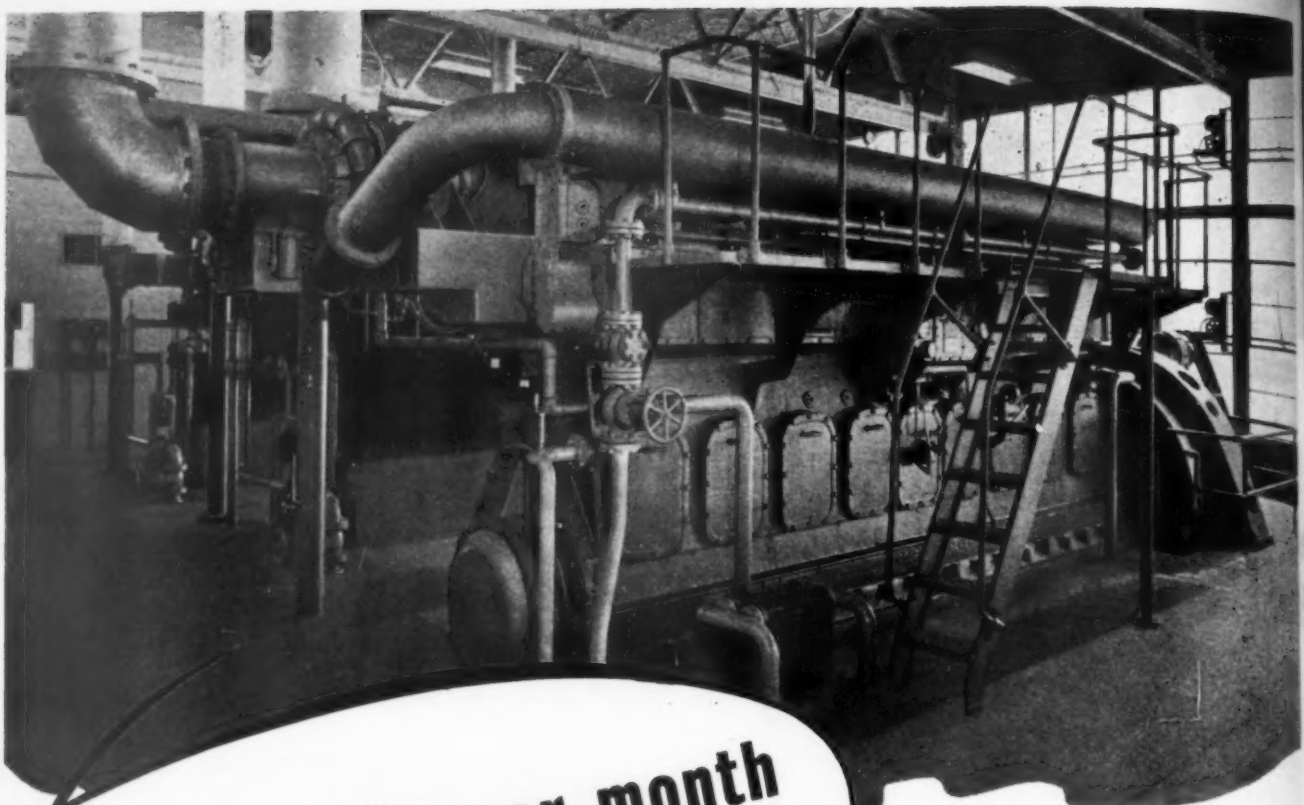
PITTSBURGH • DES MOINES STEEL CO.

PITTSBURGH, PA., 3412 NEVILLE ISLAND—DES MOINES, IOWA, 913 TUTTLE STREET

NEW YORK, ROOM 915, 270 BROADWAY · CHICAGO, 1216 FIRST NATIONAL BANK BUILDING

DALLAS, 1217 PRAETORIAN BUILDING · SAN FRANCISCO, 619 RIALTO BUILDING

SEATTLE, 520 FIRST AVENUE, SOUTH



Saves $100 per month in fuel alone!

New 1437 hp Cooper-Bessemer Type LS 8-cylinder supercharged Diesel recently installed in Portland, Michigan plant of Tri Counties Electric Cooperative. Plant's original atmospheric engines, also Cooper-Bessemers, are visible in background. New engine relieved tight load situation and permitted overhaul of the older units, their first in 22,000 hours.

For a single engine to save 100 dollars per month in fuel cost is nothing to be sneezed at in anybody's power plant. This is the comparative saving now afforded by a Cooper-Bessemer supercharged Diesel recently installed in the Portland, Michigan plant of the Tri Counties Electric Cooperative.

This well-managed plant has two other Diesels . . . five-year-old Cooper-Bessemer Type JS's. Through years of gruelling wartime service, despite frequent 10 to 25% overloads, these engines have given the kind of trouble-free service that leads users to re-specify Cooper-Bessemers whenever additional capacity is needed.

Supercharged, the new Diesel not only brings fuel economy impossible with any atmospheric engine, but it has a capacity equal to both the original engines with only a negligible increase in length.

Whatever your engine requirements may be, 100 to 2000 horsepower, supercharged or atmospheric, there is a modern Cooper-Bessemer that will give you engine performance at its best.

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington Tulsa
Dallas St. Louis Houston Los Angeles Seattle Shreveport

Sum Up The Advantages

of every Bell & Spigot Jointing Compound you know

...AND CHECK THEM *ALL* AS YOURS IN

Tegul-MINERALEAD

HEN ADD THESE EXTRA BENEFITS, WHICH YOU GET NLY IN THIS INGOT FORM JOINTING COMPOUND

NO WORRIES ABOUT WETTING

• Shelters and tarpaulins aren't needed. *Tegul*-MINERALEAD is impervious to moisture. Can be stored unprotected in the open. Rain or flood won't bother it.

NO CHANGING OF COMPOSITION IN TRANSIT

• No amount of jog and jolt in journeying to the job can shake down the heavier components of an ingot. *Tegul*-MINERALEAD reaches you as correctly mixed as when it left our plant.

EASY HANDLING . . . AND WORKING

• Whether your workmen are giants or flyweights, they'll find these 10 lb. ingots a snap to handle. They're easily broken up for the melting pot and *Tegul*-MINERALEAD melts, pours and sets quickly. Needs no skilled labor, deep bell holes or caulking. Can be worked in any temperature.

JOINTS TAKE EXTRA-ORDINARY PUNISHMENT WITH A SMILE

• Offer much higher resistance to mechanical and thermal shock. Initial leakage is reduced by Thiokol, the plasticizing agent in *Tegul*-MINERALEAD. Back filling may proceed at once and traffic hazards due to open trenches can be cleared up quickly.

*In laying and maintenance alike, Tegul-*MINERALEAD *can bring you important savings in time, labor and $ & ¢. Write our Mertztown Office for further information.*

The HYDE-RO Ring

Another Atlas aid to better bell and spigot line jointing

Cuts water waste. Saves repeated hypochlorite flushings. Speeds repairs by giving dry joints. Works with *Tegul*-MINERALEAD, lead and Portland Cement.

• Serves on Beaded end pipe and Straight end pipe . . . *Write for literature.*

THE *Atlas Mineral*

PRODUCTS COMPANY OF PENNA.

MERTZTOWN PENNSYLVANIA

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NEW YORK 16, N. Y., 280 Madison Ave.
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THE ATLAS MINERAL PRODUCTS CO. OF TEXAS, INC. Box 252, Houston 1, Texas

*DALLAS 5, Tex., 3921 Purdue St.
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*LOS ANGELES 12, Cal., 172 S. Central Ave.
*HONOLULU 2, Hawaii, U.S.A., Lewers & Cooke, Ltd., P. O. Box 2930
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SAN FRANCISCO 7, Calif. H. G. Roberts, 115 Townsend St.
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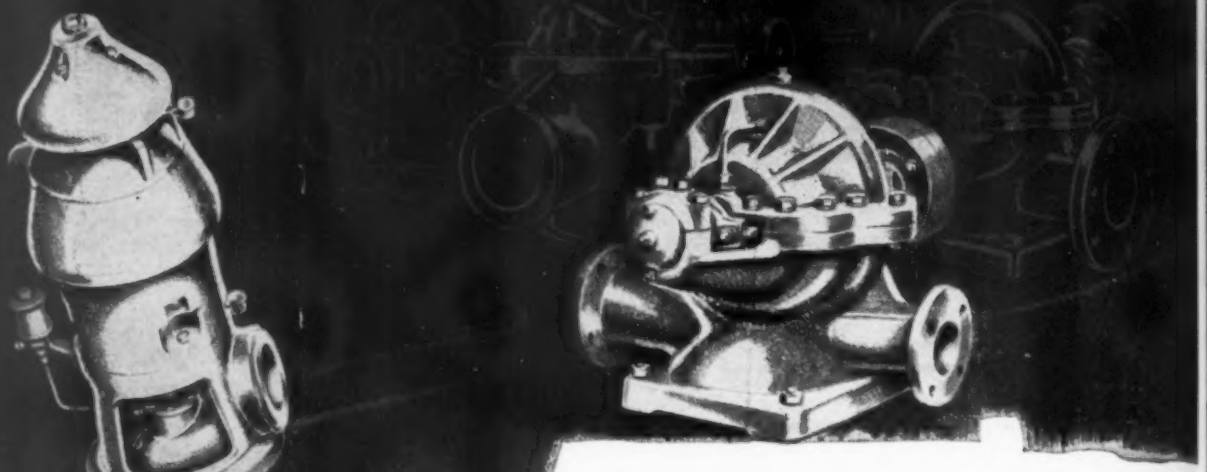
*Stock carried at these points



It's a family matter!

Yau can bring the widest variety of problems about fluids-moving to Fairbanks-Morse—*and keep them in the family!* Here's a single source—world-known and pump-wise—of proved pumping equipment, including the largest to the smallest centrifugals, vertical turbines and a broad line of special application types.

WHY NOT **place your pumping difficulties in the hands of recognized experts—men who have the broadest line, unlimited manufacturing facilities and a 116-year-old background of scientific research to offer you? See your Fairbanks-Morse dealer or call our local branch office now.**

SILENT MEMBER— **An added advantage is the line of electric motors designed and built by Fairbanks-Morse—for use on Fairbanks-Morse pumps. *They cut your pump selection job in half*—give you a pump manufacturer ready to take *all* the responsibility in selecting your pump and the power to operate it!**

OUT OF THE HOLE—**Fairbanks-Morse and Pomona deep-well turbine pumps have long been at home in bringing water out of the hole at rock-bottom cost—on farms, factories and wherever vertical turbines are used.**

FAIRBANKS-MORSE

A NAME WORTH REMEMBERING

PUMPS

Builders
WATER WORKS
Equipment

For Large Plants

One of the world's greatest engineering works brings raw water from the Colorado River and distributes treated water to the Metropolitan Water District of Southern California. The modern 100 MGD softening and filtration plant near LaVerne, California, is equipped with Builders Effluent and Wash Rate Controllers, Loss of Head, and Rate of Flow Gauges and Chronoflo Large Dial Gauges. A Builders Venturi Meter nearly 12 ft. diam. measures the plant's output.

Metropolitan Water District of Southern California Water Softening and Filtration Plant.

Operating Gallery, Zeolite Filters.

For Small Plants

Builders Equipment brings to the smaller plant the same high efficiency and dependability enjoyed by the largest. Shillington, Pa. uses only three-quarters of a million gallons of water per day, but two Builders Venturi Meters with RCE 6" Controllers maintain optimum performance. Two Builders Gauges on floor stands in this attractive plant indicate and record loss of head and rate of flow.

Builders Gauges at Morse Type filtration plant, Shillington, Pa.

Filtration Plant of unique design, Shillington, Pa.

Builders Equipment

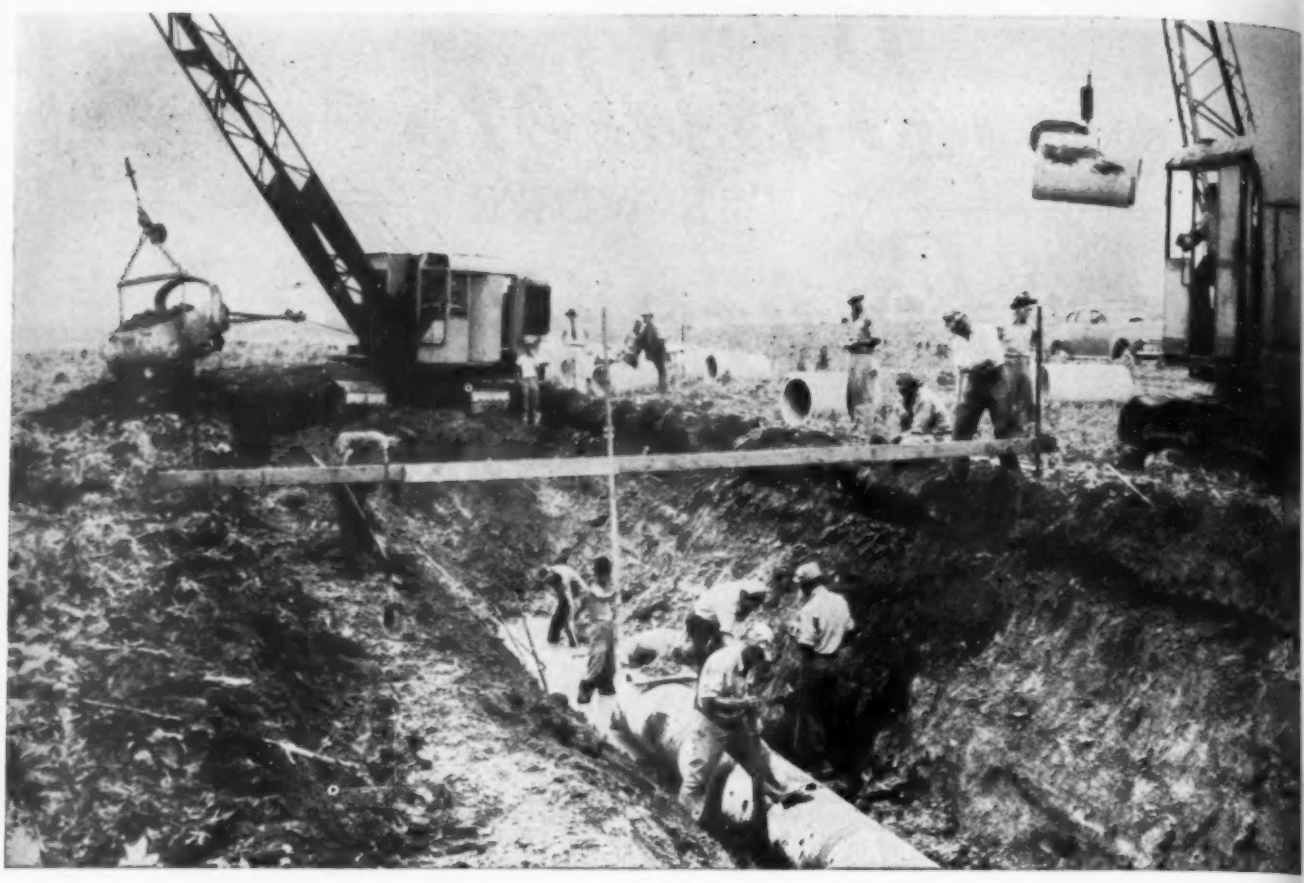
Venturi, Propeloflo and Orifice Meters • Type M and Flo-Watch Instruments • Filter Controllers and Gauges • Master Controllers • Kennison Nozzles • Chronoflo Telemeters • Conveyor Scales

Complete information and descriptive bulletins on request.

Address, Builders-Providence, Inc., (Division of Builders Iron Foundry) 10 Codding Street, Providence 1, R. I.

BUILDERS-PROVIDENCE

BUILDERS



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For Adequate Airport Drainage

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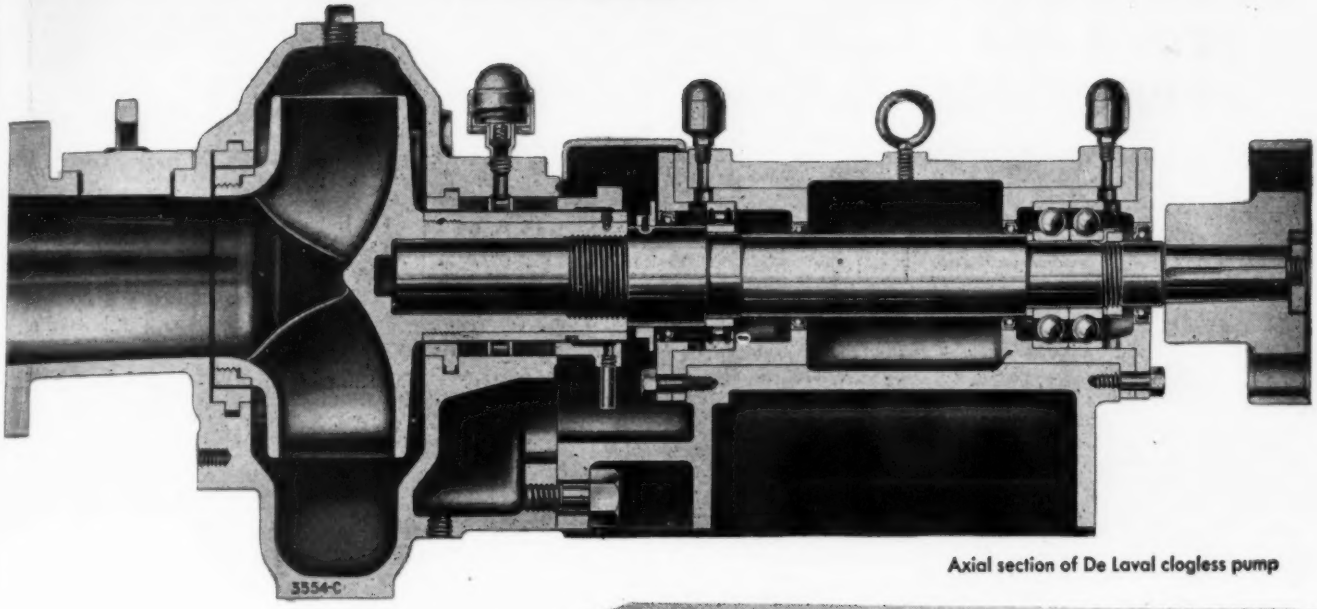

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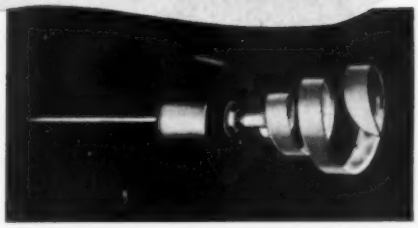

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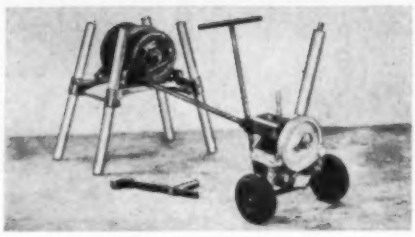

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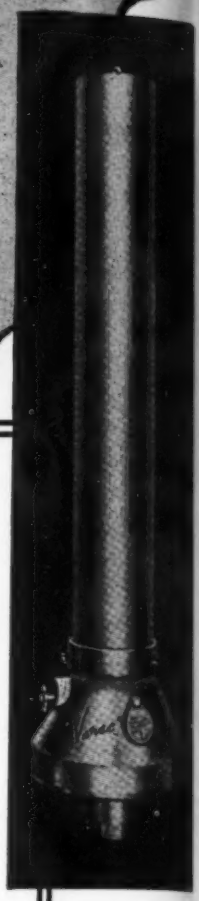

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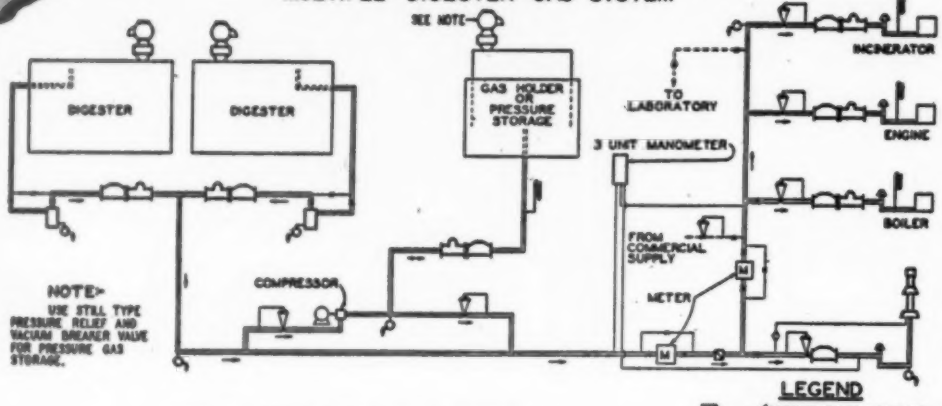

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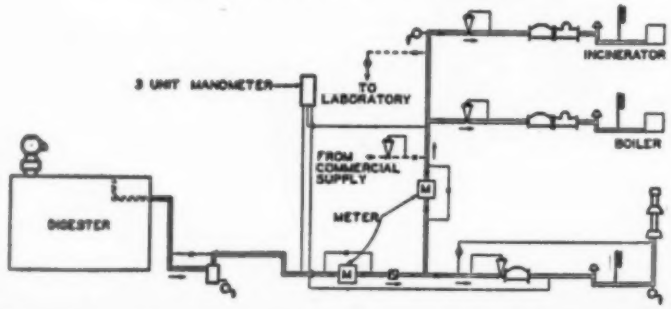

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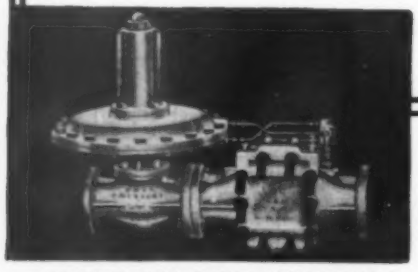

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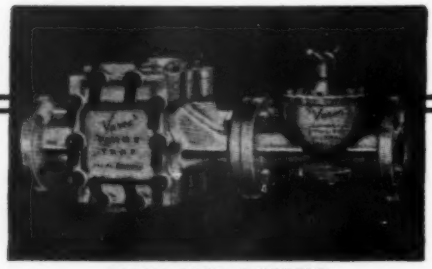

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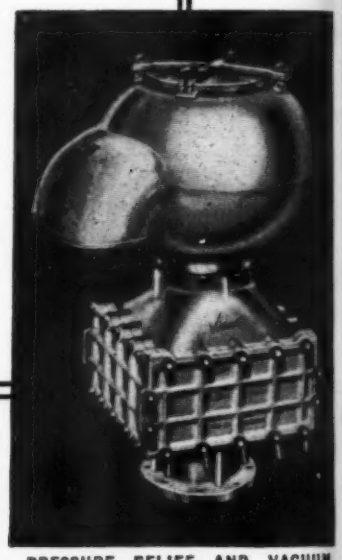

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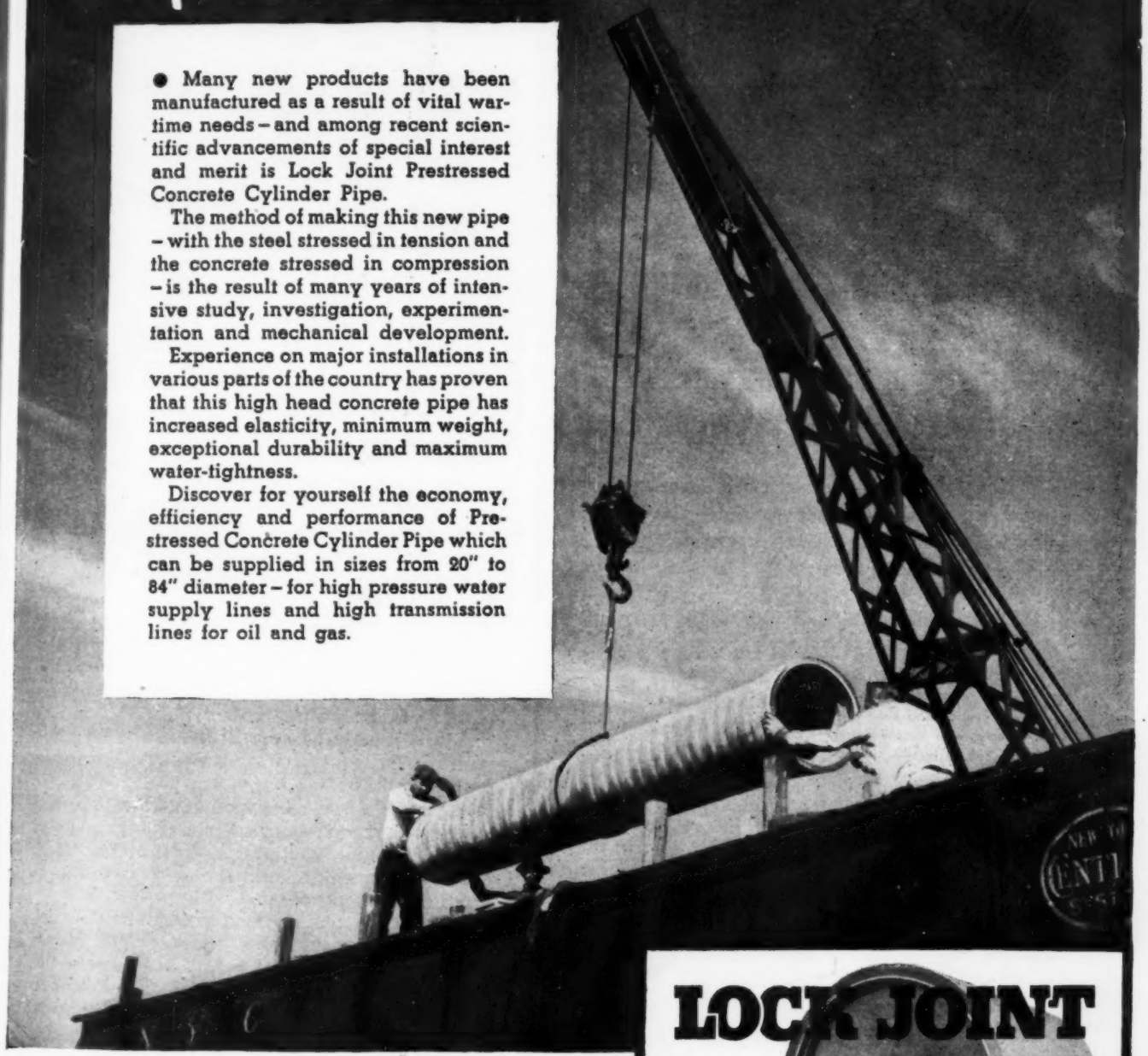

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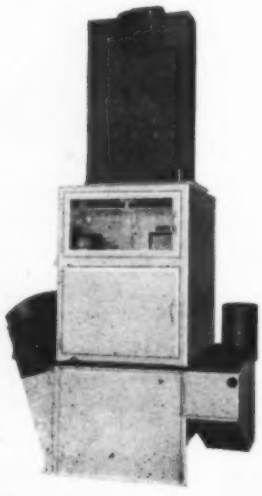

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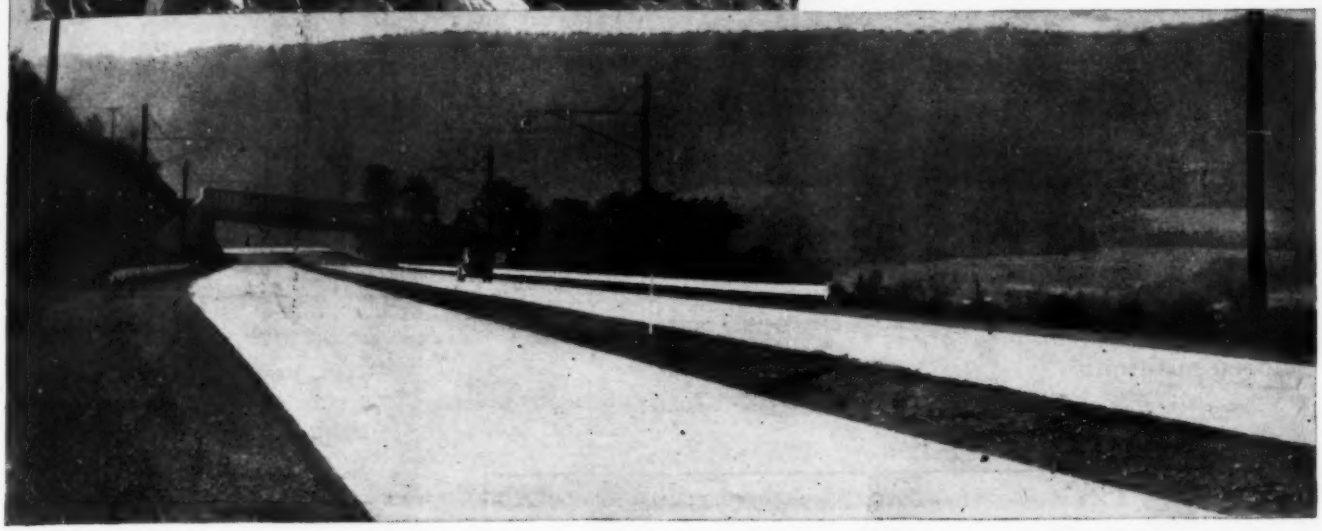

Clay Pipe is best because it is chemical-proof and abrasion proof . . . it nevers wears out. Clay, nature's indestructible material, is processed by vitrification to create this everlasting pipe. With its variety of fittings, Clay Pipe is quickly and easily installed. Engineers, builders and maintenance men depend on Clay Pipe more and more for efficient, long-life drainage and sewerage.

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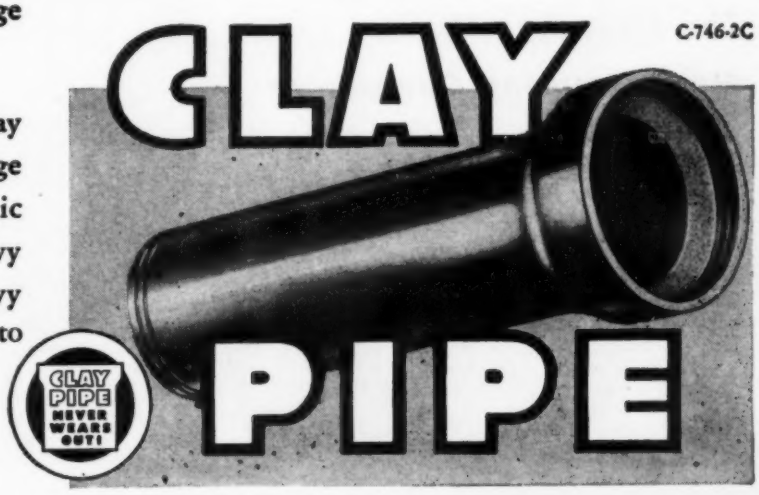

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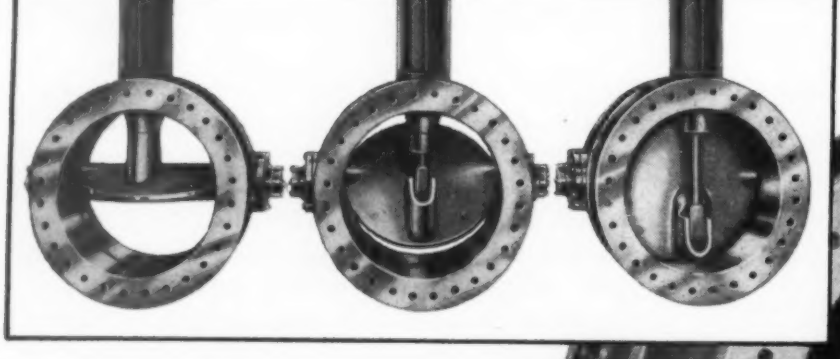

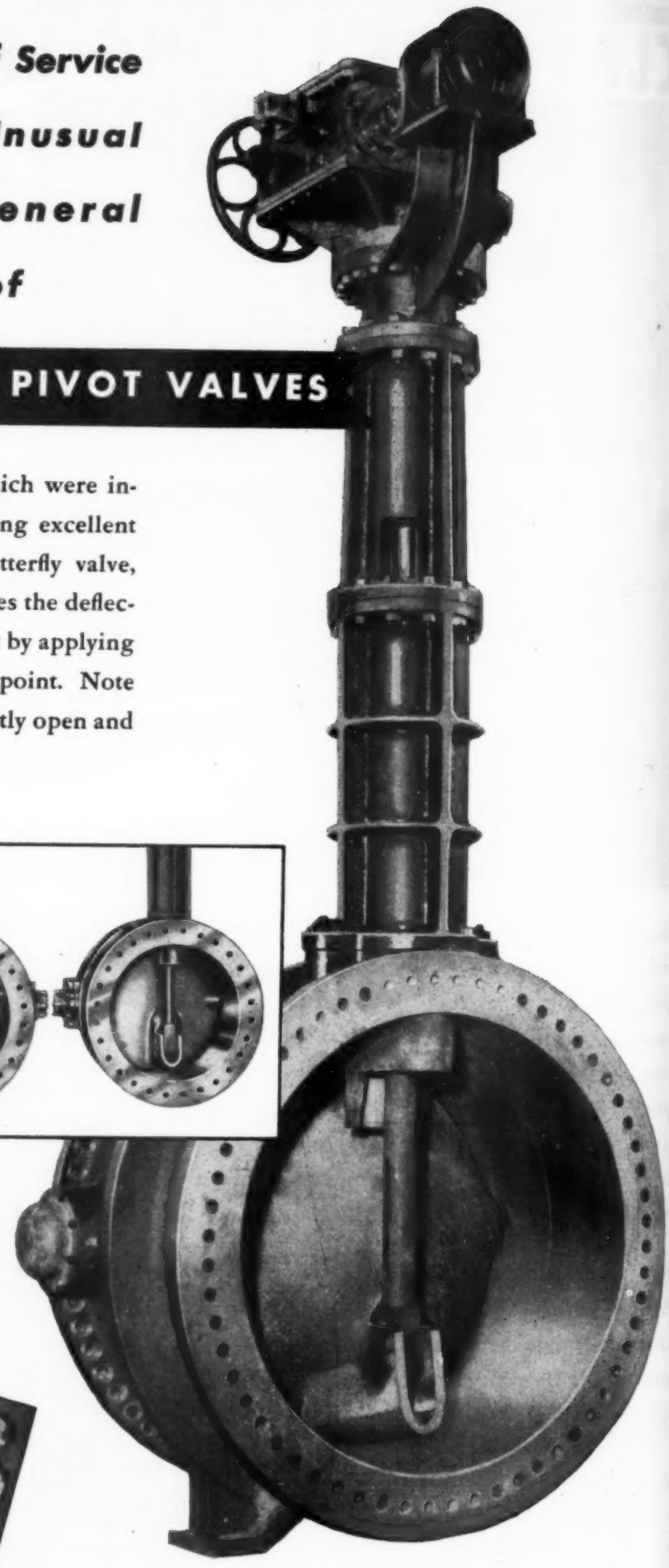

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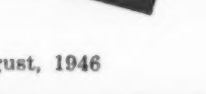

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JOHN H. MURDOCH,* Attorney,
Am. Water Wks. & Elec. Co., New York.
(*President of the Pa. Water Wks. Ass'n.)

"Sludge Lagoons"

May not only meet emergencies which arise, but in some locations may even be the whole solution to sludge disposal problems. But, lagoons must be carefully supervised and operated with common sense. Advice on construction and operation of sludge lagoons is given by an ex-plant superintendent of long experience—

DON E. BLOODGOOD,
Assoc. Prof. of San. Engr., Purdue University.

"Grand Canyon's Unique Water Pumping Plant"

Is described in an interesting article depicting some unusual pumping conditions against phenomenal heads in bringing water down in the canyon up to the rim. Operating and maintenance experiences over a period of years adds materially to the interest of this story, by—

G. L. DAVENPORT, JR.
Santa Fe Railroad.

"Corrosion in Vertical Turbine Pumps"

May be caused by galvanic action water line corrosion, carbon dioxide, or stray currents, but, whatever the cause, it is costly. Both the problem and the remedies are discussed by—

T. E. LARSON, Chemist,
State Water Survey, Urbana, Ill.

"Solving Scum Problems"

Although scum problems vary with the nature of the sewage being treated and the plant design, there are certain basic things that can be done to control scum. These are set forth by an operator who has been successful in solving the scum problem.

JOSEPH DOMAN, Supt.,
Sewage Treatment Plants, Greenwich, Conn.

"Improving Water Plant Operation With Activated Silica"

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HAROLD R. HAY, Chemical Engr.
The Philadelphia Quartz Co., Philadelphia.

"Treating Wool Scouring Wastes at a Profit"

This article, long delayed, describes a new process of purifying wastes from wool scouring plants, and other grease containing wastes, wherein the recovery of marketable grease yields an actual profit. The authors are—

HARRY A. FABER and PAUL F. HOWARD
The Chlorine Inst., N. Y. Cons. Eng., Boston

"Density Currents in Final Settling Tanks"

Have been observed at the Camp Butner, N. C., Activated Sludge Plant. Studies indicated that improved operation could be obtained by extended weirs and dropped inlets. The methods of correction and results are reported by—

STEPHEN R. KIN,
Assoc. San. Engr., Camp Butner, N. C.

VOL. 93, No. 8 — AUGUST, 1946

CONTENTS

Hydraulics for the Practical Water Works Man, Part II.... 295
By Robert W. Angus
Toronto, Canada

Water Purification Division Holds Three Sessions (A Continuation of the AWWA Convention Reports).. 299
As Reported by
Harry A. Faber

Manganese Removal by Break-Point Chlorination..... 303
By S. E. Edwards and G. B. McCall
Baltimore, Maryland

Chart for Determination of Equivalent Pipes..... 306
By J. R. Arbuthnot
Lawrence, Kansas

Filtration of Water Through Diatomaceous Earth..... 308
By S. B. Applebaum
New York, N. Y.

Training of Filtration Plant Personnel..... 311
By A. E. Clark
Nashville, Tennessee

Alabama Joins the Ranks 313

Central States Sew. Wks. Assn. Holds 18th Annual Meeting 315

A Unique and Effective Sewer Cleaner..... 321
By M. W. Loving
Chicago, Illinois

8 Year Performance Record of the Plainfield Sludge Drier.. 323
By John R. Downes
Plainfield, New Jersey

19th Spring Meeting of NYSSWA at Utica..... 325

How to Use DDT for Insect Control..... 329
By L. F. Warrick and G. F. Bernauer
Madison, Wisconsin

Water and Sewage Patents..... 333

Editorial 334

Meetings Scheduled .....Ad. Pages 88, 90

Here and There with "Doc" Symons.....Ad. Page 91

Manufacturers' and Equipment News.....Ad. Page 100

Literature and Catalog Reviews.....Ad. Page 109

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and insures better work!

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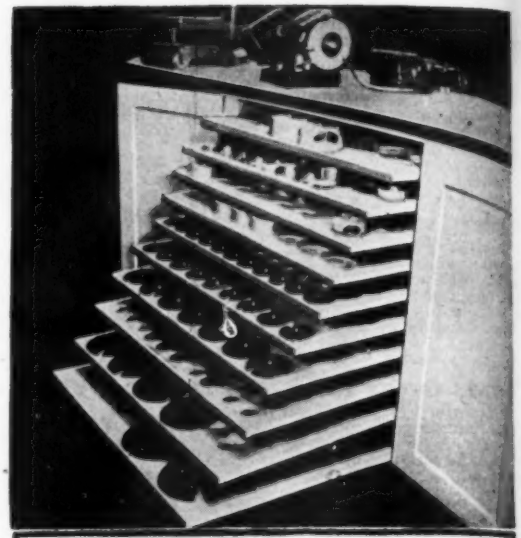
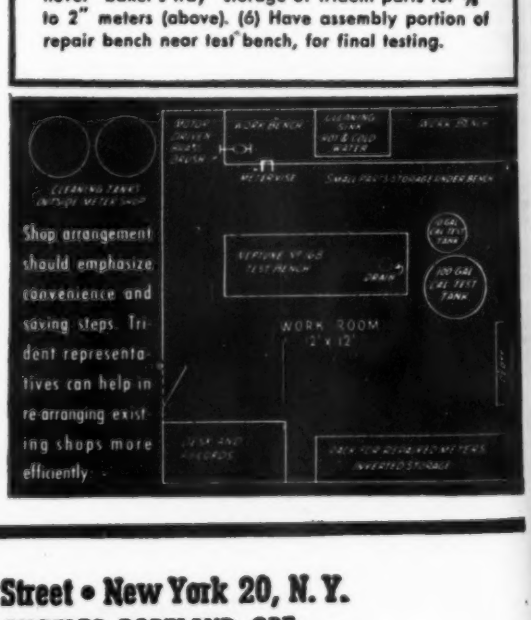


TYPICAL WORK FLOW-SHEET:
from new Manual for large and small Meter Shops.
(1) Worn meter placed on bench near door. Serial, size, reading noted on record card. Meter tested; initial test results noted. (2) Meter disassembled on this bench, or bench next to it. (3) Slop sink and cleaning tanks. (4) Cleaned meter parts go to special repair bench, or return to previous bench for repair. Divide repair bench into sections for examination and repair of separate parts. (5) Only small area needed for parts storage, due to Trident's interchangeability. Ample bin space can be arranged over or under repair bench. Keep bins closed. See novel "baker's tray" storage of Trident parts for ⅝" to 2" meters (above). (6) Have assembly portion of repair bench near test bench, for final testing.



Shop arrangement should emphasize convenience and saving steps. Trident representatives can help in re-arranging existing shops more efficiently.

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WATER & SEWAGE WORKS

VOL. 93, No. 8 AUGUST, 1946

A Gillette Publication

HYDRAULICS FOR THE PRACTICAL WATER WORKS MAN

The Second of a Series of Articles

Velocity Effects on Friction, Power, Fire Streams, Etc., The Pitot Tube and Fire Stream Gage

By ROBERT W. ANGUS, M.E.
Consulting Engineer
TORONTO, CANADA

(*Professor Emeritus of Mechanical Engineering, University of Toronto*)

CONSIDERATION has already been given to the power obtainable from water due to its elevation and to its pressure,* but there yet remains one other source, namely, that due to its velocity or the power corresponding to the "kinetic energy." Most engineers are familiar with this, for they have often seen the jet from a fireman's nozzle and will realize that where a portable or mobile fire pump is used, all the power put into the water in the hose by the pump is either lost in friction or else comes out with the jet. The jet is at atmospheric pressure, and is usually held at the approximate level of the pump, so that there is no change in elevation and no gage pressure. For water turbines under high heads, the jets are often very powerful, being sometimes a foot or more in diameter and each delivering thousands of horsepower to the turbine runner.

Somewhere about three hundred years ago many studies were begun on the velocity of water coming from nozzles. Experiments previously made on solid bodies falling freely in air showed that the time required for the body to fall a certain distance did not depend on the weight of the body and that all bodies acquired the same

The Author

velocity after falling the same vertical distance. For extremely light bodies like feathers, the relatively high air resistance affects this statement. The law for solid bodies falling freely in air is that the velocity is proportional to the square root of the distance fallen and is expressed by the relation

$$v = 8.02\sqrt{h}$$

where v is the velocity in feet per second acquired after falling from rest through a vertical height h feet; the number 8.02 is the square root of 2×32.16 where 32.16 ft. per sec. for each elapsed second is the acceleration due to gravity. After a body has fallen 4 ft., its velocity from this formula $(8.02\sqrt{4})$ is 16.04 ft. per sec. and this is only doubled when it has fallen another 12 ft., or a total of 16 ft., because $8.02\sqrt{16} = 32.08$ ft. per sec.

Following these experiments, many measurements were made on jets. These showed that if a smooth and nearly frictionless nozzle was fixed into the side or bottom of an open tank containing water, then the velocity of water in the jet, when the surface of water was h ft. above it, was exactly the same as that of a solid body falling through the same height. Thus, if the depth of water above the nozzle was 4 ft., the velocity of the issuing water from the nozzle was found to be 16.04 ft. per sec. $(8.02\sqrt{4})$, and a similar law applies to all heads and to all nozzles, and likewise to smooth orifices in the side of the tank.

RELATION BETWEEN VELOCITY AND POWER

This introduces an interesting and important idea, for it shows that, as far as power is concerned, it is possible to substitute an additional head to compensate for the velocity. If, at a point on a pipe, the pressure by the gage is 60 ft. and the velocity is 16.04 ft. per sec., then the power available at that point, due to these two, would be the same as that obtainable from water in an open tank where the surface of the water is

*Subject of first article in the series. See page 261, *W. & S. W.* for July, 1946.—Ed.

TABLE I

Velocities in Pipes

Pipe size (in.)	Actual diam. (in.)	Area (sq. ft.)	Velocity ft. per sec. for 100 U. S. gal. per min.	Pipe size (in.)	Area (sq. ft.)	Velocity ft. per sec. for 1,000 U. S. gal. per min.
1	1.049	.00600	37.1	4	.0873	25.50
1¼	1.25	.00852	26.2	6	.1963	11.33
1½	1.50	.01227	18.2	8	.349	6.37
2	2.067	.0233	9.6	10	.545	4.07
3	3.068	.0513	4.3	12	.785	2.83

1000 U. S. gallons per minute = 1.44 million gallons per 24 hours. One cubic foot per second (1 c. f. s.) = 450 U. S. gallons per minute (450 g. p. m.)

$60 + 4 = 64$ ft. above a connected pipe. The 4 ft., or the height necessary to produce the 16.04 ft. per sec. velocity, is commonly called the "velocity head" and is given by $h = v^2/64.32$, which is only another form of the relation already given. 60 ft. of water, and the velocity of the water is known to be 16.04 ft. per sec., then the actual power in each pound of water flowing in one minute through the pipe is the same as if the pound of water was going over a waterfall $6 + 60 + 4 = 70$ ft.

tion losses in pipes, elbows, water meters, etc., are almost exactly proportional to the velocity head, an idea familiar to most practical water works men who are being constantly reminded that the frictional loss varies with the square of the velocity; if a pipe carries 1000 gallons of water per minute its loss of head (power) due to friction is only about one quarter what it would be if the pipe carried 2000 gallons per minute. In water works distribution piping velocities are often around 4 ft. per sec., for which the velocity head is $v^2/64.32 = 16/64.32 = 0.25$ ft., which is small compared with pressure heads, shown by gages on the pipes,

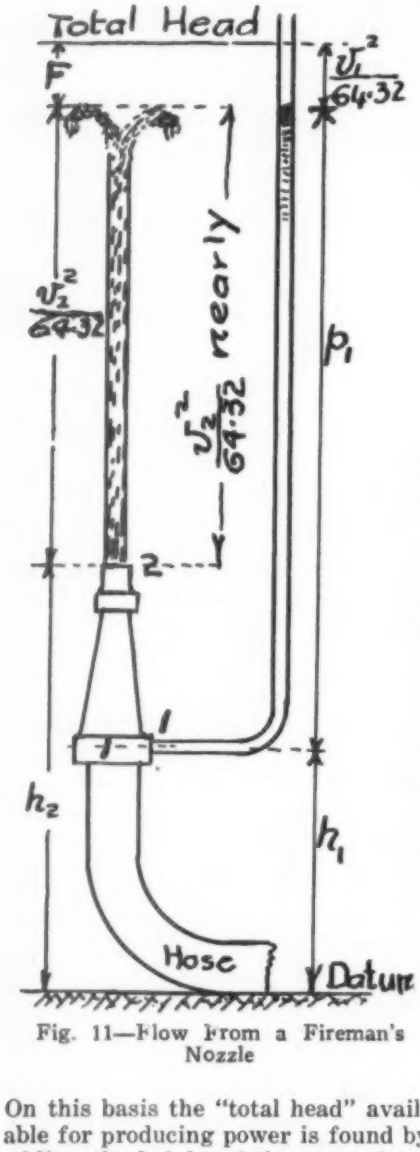

Fig. 11—Flow From a Fireman's Nozzle

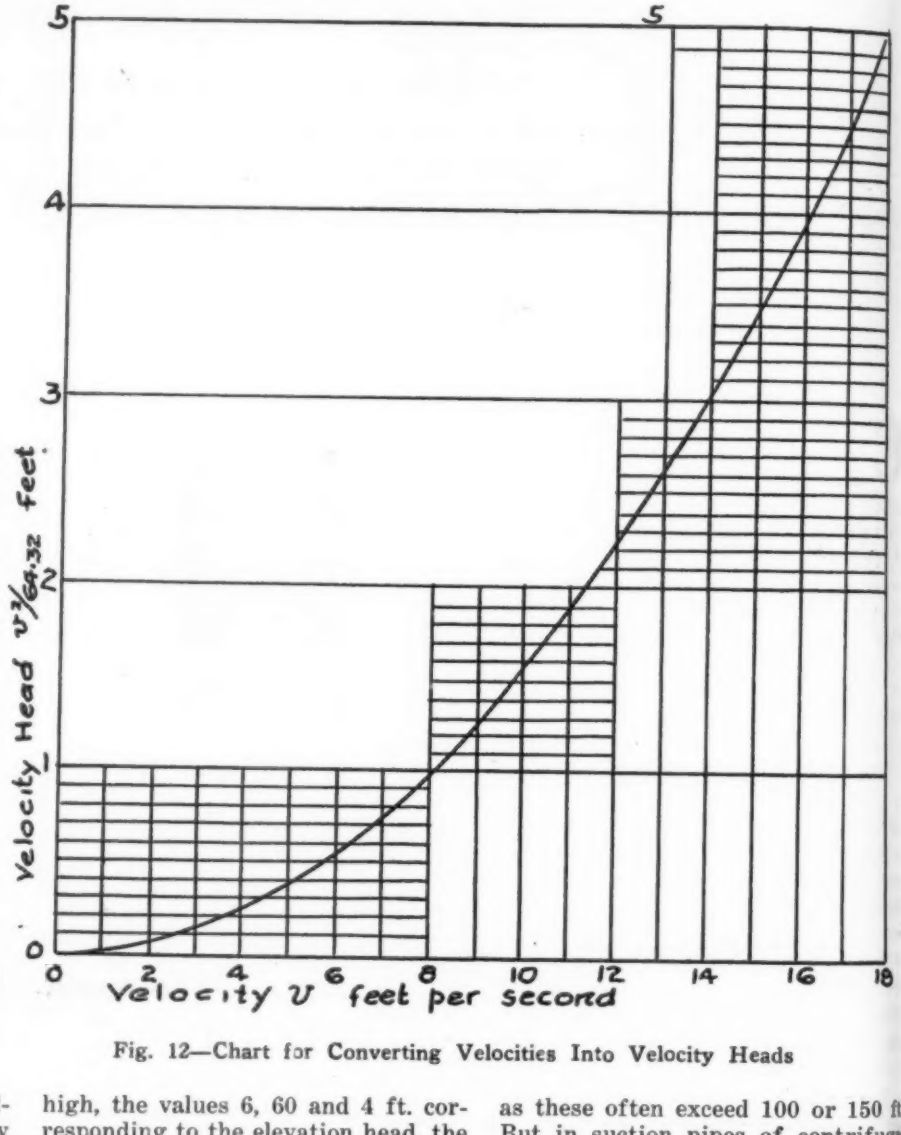

Fig. 12—Chart for Converting Velocities Into Velocity Heads

On this basis the "total head" available for producing power is found by adding the height of the gage above the datum plane (elevation head), the pressure in feet indicated on the gage (pressure head), and the velocity head.

This statement is, in effect, that if at any point on a pipe line situated, say, 6 ft. above the selected datum, the pressure gage indicates high, the values 6, 60 and 4 ft. corresponding to the elevation head, the pressure head, and the velocity head, respectively.

FRICTION IN PIPES AND HEIGHT OF FIRE STREAMS

Velocity head is of very great importance in hydraulic work, as subsequent examples will show. Friction losses in pipes, elbows, water meters, etc., are almost exactly proportional to the velocity head, an idea familiar to most practical water works men who are being constantly reminded that the frictional loss varies with the square of the velocity; if a pipe carries 1000 gallons of water per minute its loss of head (power) due to friction is only about one quarter what it would be if the pipe carried 2000 gallons per minute. In water works distribution piping velocities are often around 4 ft. per sec., for which the velocity head is $v^2/64.32 = 16/64.32 = 0.25$ ft., which is small compared with pressure heads, shown by gages on the pipes, as these often exceed 100 or 150 ft. But in suction pipes of centrifugal pumps, for instance, where the pressure is often below atmospheric, a velocity of 13 ft. per sec. would correspond to a velocity head of about 3.63 ft., which might be extremely serious in its effect on the pump, and it is never safe to assume this head is relatively negligible without first finding what its effect will be.

The following simple illustration of the meaning of velocity head may be helpful. If a shot of any size is dropped from a tower 100 ft. high, its velocity, when it strikes the ground, will be $v = 8.02\sqrt{100} =$ 80.2 ft. per sec., and if, on the other hand, a shot leaves a vertical air gun with a muzzle velocity of 80.2 ft. per sec. and moves through quiet air, it will rise to a height of 100 ft. above the muzzle. Not uncommonly, water leaves a fire nozzle at 80.2 ft. per sec., and if the nozzle points straight up and there is no wind, the stream should rise to a height given by $80.2 = 8.02\sqrt{h}$ or to a height h of 100 ft. Some of the highest drops actually do very nearly reach this height, but the air resistance has a tendency to break up the stream into spray and the air effect on small drops is very marked. Of course, this stream would not be used to fight a fire at anything near 100 ft. above the nozzle, and at heights considerably below this the energy in the water would be so low that the stream would be very ineffective. Actually the stream would not be used to reach a fire much over 60 ft. up.

This case is illustrated in Fig. 11, where the nozzle is pointing straight up and an open glass tube is shown attached at Section 1, at the base of the play pipe. The ground is taken as the datum and the elevation head is marked h_1 and the water rises in the glass tube by the pressure head p_1. The velocity head $v_1^2/64.32$ must also be added to give the total head at the base of the play pipe. Many tests have shown that the friction loss between the base of the play pipe and the tip of the nozzle is equal to the velocity head in the hose, that is, $F = v_1^2/64.32$.

At the nozzle the stream has a velocity v_2 and the jet would rise nearly $v_2^2/64.32$ ft. after leaving it, as already stated. For instance, if a pressure gage is attached at the base of the play pipe, as is often done by an inspector, and this gage reads 50 ft. pressure, then the highest drops of the stream will rise nearly 50 ft. above the gage.

For the convenience of those not familiar with the slide rule as a calculating instrument, in Fig. 12 is offered a curve of velocity heads corresponding to velocities up to 18 ft. per sec. In any problem the velocity in a pipe corresponding to a known discharge may be easily found from Table I (repeated from the first installment) and using this on Fig. 12, the corresponding velocity head *in feet* is read off.

THE PITOT TUBE AND FIRE STREAM GAGE

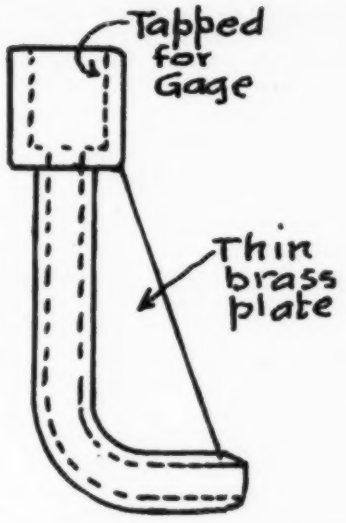

Fig. 13—Simple Pitot Tube, with Vane for Making Hydrant or Nozzle Flow Tests

A very interesting application of velocity head is in the well-known Pitot tube used for measuring velocity of water and one very common application is in finding the discharge of fire streams, for which purpose inspectors find it most convenient. While somewhat elaborate forms of this tube are on sale and are most adaptable, any engineer can make one of his own, as the writer has done, by bending a short piece of small brass tubing and soldering to it a coupling so that an ordinary pressure gage graduated in feet may be attached to it. Such a simple form of the tube with its attached gage is shown in Fig. 13. It has already been stated that the power, per pound of water discharge per minute, due to its velocity v, is the same as it would be if the same pound per minute ran over a waterfall of a height of h ft., where the quantities are connected by the relation $v = 8.02\sqrt{h}$; or in another form, $h = v^2/64.3$. For example, this formula shows that where $h = 6.22$ ft., the velocity $v = 20$ ft. per sec. If a tube made as in Fig. 13 (bent so that the gage will be out of the way of the water jet when using the device) is held in a stream so that the open end faces squarely into the jet, then the gage should read 6.22 ft. if the velocity is 20 ft. per sec., because a column of water 6.22 ft. high could produce a velocity of 20 ft. per sec., and this would just balance the corresponding velocity energy in the jet. It is much the same as saying that if a piece of shot rolled off a shelf and fell down to the vertical muzzle of a tube 6.22 ft. below it, where it met another shot of exactly the same weight just leaving the muzzle at 20 ft. per sec., then the force produced by one of these pieces of shot would be exactly the same as that produced by the other and both would instantaneously come to rest.

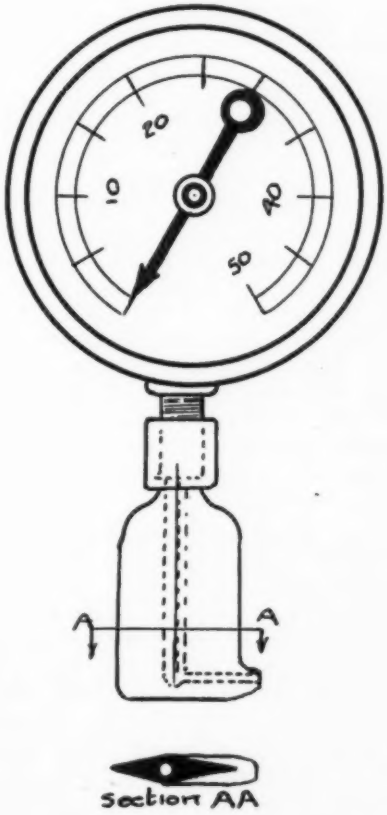

Fig. 14—Commercial Model of Fire Stream Gage, Using Pitot Tube of Stream-lined Design

The inspector inserts the tube into the stream in such a way that the bent part is along the center line of the stream, reads his gage pressure in feet, which is the velocity head h. He then calculates the velocity $v = 8.02\sqrt{h}$, and multiplies this velocity by the area of the nozzle to get the discharge. For example, with a 1¼ in. parallel nozzle, which has an area .00852 sq. ft. (Table I), if the gage reads 35.8 ft., then the velocity will be $v = 8.02\sqrt{35.8} = 48$ ft. per sec., and the discharge would be $48 \times .00852 = .409$ cubic feet per second, which is easily shown to be 184 gallons per minute, since from Table I 450 gallons per minute is the same as one cubic foot per second. This tube may be discussed in greater detail later, but it should be stated here that the pressure in the fire stream as it leaves the nozzle is atmospheric, and also that a great many measurements made on fire streams show that at the nozzle all drops of water have

almost identical velocities, so that the gage reads practically the same whether the tube is near the center or near the side of the jet. Convenient tables have been made up which give the discharge in gallons per minute for each gage reading and for several different sizes of nozzles, and these tables are issued free as an advertisement by some fire engine builders.* While the ring nozzle is not in very common use, it should be noted that it only gives about 74 per cent of the discharge of the conical nozzle of the same size and with the same gage pressure; the reason for this will be explained later.

While the simple form of Pitot tube is satisfactory for lower velocities, it is not structurally strong enough for the higher ones. The reason is that the tube must be kept of small size to prevent interference with the stream and it is therefore apt to vibrate when used on the larger nozzles and discharges. The instrument as sold for fire stream measurement is usually of the form shown as Fig. 14, the back of the gage sold with the instrument being graduated so that the discharge for any size nozzle and any gage reading may be read directly. Those using the device considerably will find the commercial models very handy, but if only a few measurements are to be taken, the home-made form is perfectly satisfactory and accurate.

The Pitot tube is also used to measure the velocity in a water pipe and is then modified in form because the pressure in the pipe must be taken into account; in case of the fire stream the pressure is atmospheric. In a water works main the pressure in the tube which faces upstream is due to the velocity plus the pressure in the main. Consequently, it is necessary to subtract the pressure in the pipe from the reading of the gage attached to the Pitot tube. This could, of course, be done by attaching a second pressure gage to the wall of the pipe so as to read the pressure, and by subtracting this reading from that of the gage on the Pitot tube the velocity head is readily found. Such a method is of little practical help because readings cannot be taken with sufficient accuracy as the following illustration shows. A common velocity in distribution mains is 4 ft. per sec., for which $v^2/64.3 = 0.25$ ft. (see Fig. 12), while pressures of (80 lbs. per sq. in. or) 185 ft. are not unusual, so that for this case the Pitot tube gage would read 185.25 ft., and the pressure gage would read 185 ft., but everyone knows that the gages could not be read accurately enough to be sure that the difference between them was 0.25 ft.

In measuring the velocity in a pipe under pressure, therefore, a special form of Pitot tube (such as the "Pitometer") is used and a special form of gage, referred to as a differential gage, is attached to it so that the differential gage automatically reads the velocity head only or, in other words, in the preceding example it would read the 0.25 ft. directly. If an ordinary pressure gage could be made with a watertight case which could stand high pressure, then if the gage was connected in the ordinary way to the Pitot tube and if at the same time a connection is made from the wall of the pipe to the watertight gage casing, then the spring tube in the gage would be subjected on the inside to the sum of the pressure and velocity heads, and on the outside to the pressure head only, so that the gage would indicate the velocity head only. Practical difficulties prevent the use of this construction and the differential gage is commonly a U-shaped glass tube containing mercury or air or some other fluid which separates the water columns produced by the Pitot tube and the pipe wall and gives the velocity head in very accurate values.

(This is the second of a series of articles, "Hydraulics for the Practical Water Works Man," appearing in consecutive issues of *Water and Sewage Works*.)

*Such a table is also to be found on page R-62 in the 1946 Reference and Data Number of *Water & Sewage Works*—April, 1946—under "Hydrant Discharge Measurements."—E.J.

Prof. Fair Now Dean of Harvard Graduate School

Gordon Maskew Fair, Professor of Sanitary Engineering at Harvard University, has been appointed Dean

of the Harvard Graduate School to fill the position left vacant by the retirement of Prof. Malcolm Westergaard. Prof. Fair will continue as Gordon McKay, professor of Civil Engineering, and will continue his work in connection with the international division of the Rockefeller Foundation. At the present time Dean Fair is in Brazil in connection with public health studies for the Foundation.

Col. F. B. Elder Joins A.P.H.A. Staff

Col. Francis B. Elder, formerly of the Sanitary Corps, has been appointed Engineering Associate in the central office of the American Public Health Association. In addition to the development of the role of personnel in environmental sanitation, Col. Elder will also be concerned with the publication of Standard Methods for the Examination of Water and Sewage and Standard Methods for the Examination of Dairy Products.

Col. Elder was graduated from Rutgers University with a degree in Municipal and Sanitary Engineering. He also holds an M. S. degree in Public Health from the University of Michigan. During the war Col. Elder was an Instructor at the Medical Field Service School, Carlisle Barracks, Pa.; Director of the Dept. of Sanitation, Med. Adm. Corps, O.C.S., Camp Barkeley, Tex.; Engr. Consultant for the Public Health Branch of the Civil Affairs staff division of Supreme Headquarters, AEF, and of the Office of Mil. Govt., Headquarters, U. S. Forces, European Theater.

H. R. Hay Goes to Europe For Six Months' Study

Harold R. Hay, of the Chemical Department of Philadelphia Quartz Co., left the United States on July

6 for a six months' study of water treatment in Europe.

During the six-month period, Mr. Hay will visit Britain, Denmark, Norway, Sweden, Finland, France, Belgium, The Netherlands, and possibly Germany and Russia.

THE WATER PURIFICATION DIVISION HOLDS THREE SESSIONS

A Report by
H. A. FABER*
Editorial Associate

AT THE St. Louis meeting, the Water Purification Division of the A.W.W.A. elected new officers and held three largely attended technical sessions. The division considers itself especially fortunate to be headed by the slate of officers proposed by Marsden Smith's nominating committee and elected unanimously by member vote. (For list of officers see our June issue for first installment of this report—Ed.) It recognizes a distinct loss, however, in the retirement of Charles R. Cox as its secretary-treasurer after eleven years of exceptional service in that position. The outstanding contributions of Mr. Cox were commented upon by

New Chairman
C. K. Calvert
Engr.-Chemist
Indianapolis, Ind.

New Secretary
I. M. Glace
Cons. Engr.
Harrisburg, Pa.

Div. Director
J. B. Kerslake
Supt. Fil'r.
Milwaukee, Wis.

Div. Director
C. M. Haskinson
Chief Engr.
Div. of Water
Sacramento, Calif.

Norman J. Howard and were acknowledged by a rising vote of thanks. The division feels that an excellent selection was made by the appointment of I. M. Glace to succeed Mr. Cox in this important position.

The first of the three technical sessions was devoted to reports on the progress made by five committees of the division and to open discussion of the studies which several of these committees are undertaking. The second session presented up-to-date information on the control of corrosion, with special reference to distribution systems and hot water units. Plant operating problems constituted the subject for the third session.

*Research Chemist, The Chlorine Institute, New York.

COMMITTEE REPORTS

"Manual of Water Quality and Treatment," by A. Clinton Decker, Sanitary Engineer, Tennessee Coal, Iron, and Railroad Co., Birmingham, Ala.

Mr. Decker reported the new manual to be near completion. Each chapter in the last edition has been revised by specialists in the field covered by that chapter, and some have been extensively rewritten. Certain chapters have been divided into smaller sections for the purpose of more comprehensive treatment. Review of the material submitted indicates that the forthcoming manual will set a high standard of technical information and will represent a great advance over the previous editions.

"Permissible Loadings and Capacity of Water Treatment Plants," by Douglas Feben, Senior Sanitary Chemist, Filtration Plant, Detroit, Mich.

While no formal report was presented by Mr. Feben for his committee, the subject was extensively discussed. The unfortunate implications of the title given to this study were recognized and the intended purpose was more clearly defined. Retention of the committee to evaluate the conditions of plant loading which now exist was decided upon. Work will now be undertaken by the committee under the title: "Loadings and Capacities of Water Treatment Processes."

"Biological and Chemical Problems of Water Distribution Systems," by Marsden Smith, Chief Engineer, Dept. of Public Utilities, Richmond, Va.

This committee was unable to function until January, 1946, but the time from then until Mr. Smith's report has been adequate to provide a concept of the complexity of this problem. The committee has decided to obtain standardized and comparable data from selected water systems for a period of one year, including small as well as large systems in the study. These systems can be selected only when cooperation of local authorities is offered to the committee, and when willingness is expressed to report uniform data. The nature and the

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Chas. R. Cox
Bureau Chief
N. Y. Dept. Hlth.
Albany, N. Y.

Div. Director
Geo. J. Turre
San. Engr.
Water Comm.
Denver, Colo.

degree of water quality depreciation during this period will be determined if the voluntary assistance required can be obtained.

"Specifications for Filtering Materials," by Richard Hazen, Consulting Engineer, Malcolm Pirnie, New York, N. Y.

This is another committee which has been reactivated since the war, and it is now planned that standard specifications (not tentative ones) shall be developed. Mr. Hazen believes conservative limits can be fixed between good and bad standards so that those decided upon will be safely applicable. Among suggestions made toward the modification or tightening of specifications are the inclusion of coal and quartz as media, and the adoption of sieve mesh sizes instead of millimeter sizes for the measurement of sand.

"Specifications for and Methods of Testing Zeolites," by Daniel Davis, The Chester Engineers, Pittsburgh, Pa.

Committee Chairmen

A. C. Decker
San. Engr.
T. C. & I. Ry.
Birmingham, Ala.

Marsden C. Smith
Chief Engr.
Dept. Utilities
Richmond, Va.

Mr. Davis reported his committee to be of the opinion that standard specifications must definitely be considered tentative at present, since this field is in a state of flux. Recent correspondence indicates the present tentative specifications would in some instances be acceptable as standard but, in other instances, could be approved only as suggested or non-standard test methods. It is intended that anion exchange zeolites should be included and that many of the newer exchange materials should be investigated for future specifications. The committee solicits aid from members working in this field.

SYMPOSIUM ON DOMESTIC WATER STORAGE TANKS

"General Review of Studies on Failures of Domestic Hot Water Storage Tanks," by C. P. Hoover, Chief Chemist, Filtration Plant, Columbus, Ohio.

Every week, according to the statement made by Mr. Hoover, some 12,000 hot water heater tanks are replaced in the United States. In spite of alibis offered by tank manufacturers and plumbers, the responsibility for this condition cannot all be assigned to water works operators. The studies started at Columbus in 1935, in which the factors affecting corrosion have been continuously investigated have disclosed an inherent weakness of galvanized tanks to be in the zinc coating. Since this coating must be protective until scale can form, it should be of good quality and free of imperfections.

Slides were employed to illustrate the appearance of tank linings after one to two years of exposure to specific conditions. Both resinous coatings and cathodic protection have proved very effective, but the addition of polyphosphate up to 1.5 ppm. in water of high pH has not been found satisfactory. It has been established that a pH of 10.3 is required to protect hot water tanks.

Overheating is probably the most widespread cause of failure. Many homes are provided with tanks of inadequate capacity and galvanized tanks are generally installed because of lower cost and less weight. Poor galvanizing contributes to premature failure, but poor fabrication and the use of dissimilar metals may eventually be responsible. Spectrographic analysis indicates that a difference of one per cent of tin in the composition of the lining may be very important. It appears better to pick a tank having a dull coating.

Deaeration is effective in reducing corrosion but is generally impracticable in municipal supplies. Increase in alkalinity, the maintenance of carbonate stability, and the use of silicates are recommended methods of treatment. That water purification plants should be put to greatly increased costs for protective treatment seems unfair when the problem could be largely solved by proper tank construction and by prevention of overheating.

"Corrosion of Galvanized Hot Water Tanks," by J. M. Bialosky, Armour Research Foundation, Chicago, Ill.

Mr. Bialosky described investigations made for the manufacturers of hot water tanks, and reported findings in general agreement with those of Mr. Hoover. In addition to the factors previously described, corrosion is proportional to the flow of electric current and is influenced by the rate of heating. Side burners in gas-heated tanks are much superior to the horseshoe heater placed below the tank. Important recommendations are that an adequate size of tank be selected and that it should be insulated to preserve the lowest rate of heating.

"Some German Methods of Heating Water for Domestic Use," by Dr. H. L. Anthony, Senior Fellow, Mellon Institute of Industrial Research, Pittsburgh, Pa.

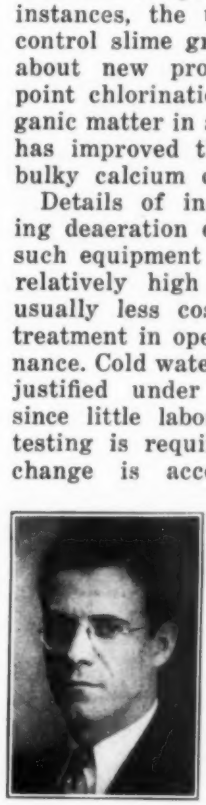
Illustrating his discussion with slides, Dr. Anthony reviewed German methods of providing domestic hot water. Coal was in short supply and gas was expensive; coal stoves were always equipped with a hot water container. Hot water heaters were almost all of the instantaneous type, water being heated just before use and not stored. There is little useful information from this source which can be applied to the higher standards of sanitation of the United States.

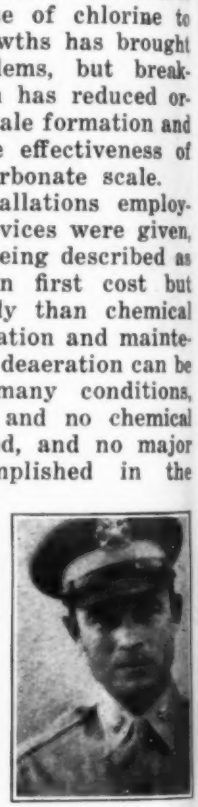
COLD WATER CORROSION CONTROL DISCUSSED IN TWO PAPERS

"Corrosion Control—Theory and Practice," by S. T. Powell, Consulting Chemical Engineer, Baltimore, Md.

Mr. Powell's paper, stressing recent developments in this field, was read by Mr. J. R. Lill, Field Supervisor, from Mr. Powell's office. Problems of corrosion would be practically non-existent if water contained no dissolved oxygen, or if metal surfaces were adequately protected. Chemical methods of corrosion prevention must be well understood and carefully controlled if satisfactory results are to be obtained. The deposition of calcium carbonate scale often stops corrosion, but often severely decreases heat transfer also. Such scale may be too little, too much, or may vary with the temperature. In several instances, the use of chlorine to control slime growths has brought about new problems, but breakpoint chlorination has reduced organic matter in scale formation and has improved the effectiveness of bulky calcium carbonate scale.

Details of installations employing deaeration devices were given, such equipment being described as relatively high in first cost but usually less costly than chemical treatment in operation and maintenance. Cold water deaeration can be justified under many conditions, since little labor and no chemical testing is required, and no major change is accomplished in the





Programmers

Douglas Feben
Sr. Chemist
Water Dept.
Detroit, Mich.

Thos. M. Riddick
Consulting
Engr. & Chemist
New York, N. Y.

water. One industrial installation cited as an example paid for itself in less than two years through savings in boiler tubes. Pilot plant studies of deaeration equipment is recommended in connection with

long pipe lines, industrial installations, and any completely closed water system.

"Corrosion Control—Discussion," by B. A. Poole, Director, Division of Environmental Sanitation, Indiana State Board of Health, Indianapolis, Ind.

Studies of Army, Navy, and industrial installations of hot water heating equipment, Mr. Poole pointed out, can frequently advance more rapidly than studies of municipal supplies—because an immediate appreciation of losses due to corrosion is apparent in the former. Such studies were made at military installations during World War II because severe corrosion problems were encountered, and because conditions were made extremely severe by the requirement that water for dish and utensil sterilization have a temperature of at least 180° F. Experience at Army posts showed a 2 to 4 ppm. dosage of polyphosphates to lessen the scale problem but to make the corrosion problems even more severe. The use of high doses of polyphosphates (up to 12 ppm.) was effective in soft water supplies for control of hot water corrosion.

Sodium silicate was beneficial (with or without polyphosphate) but high doses of 12 to 15 ppm. are necessary, at least until a protective coating is well established; when the water is low in calcium content, lime must be added. Combined treatments using silicate and lime, caustic soda and silicate, or lime and polyphosphate, may frequently constitute the best treatment for the conditions existing in a given water supply. The most suitable method of treatment must be determined by an analysis of conditions, since no universally applicable method is known.

Committee Chairmen

Richard Hazen — *Malcolm Pirnie* — *Engineers* — *New York, N. Y.*

Dan E. Davis — *The Chester* — *Engineers* — *Pittsburgh, Pa.*

In the discussion which followed these papers, **Owen Rice,** Hall Laboratories, Pittsburgh, Pa., reported on studies which show small amounts of copper in water to accelerate the rate of corrosion on galvanized iron. Calgon is frequently made ineffective by reacting to arrest corrosion and does decrease the rate of corrosion but cannot control it unless large doses are used.

C. K. Calvert, Supt., Indianapolis, Ind., recommended that water be separately treated by the user when protection must be provided at very high temperatures. **L. H. Enslow,** Editor, *Water and Sewage Works,* agreed that it is not economically justifiable for a water works to pay the high treatment cost required to prevent corrosion such as may occur in a few extreme or isolated conditions. **L. T. Purcell,** San. Eng., Wanaque, N. J., cited examples of distribution system aftergrowths which appeared to be stimulated by the presence of polyphosphates.

"Enemy Water Supply Equipment," by C. W. Karstens, Chief, Distribution Section, Water Supply Equipment Branch, The Engineer Board, Fort Belvoir, Va.

The investigation of foreign equipment has been difficult since its development was generally in the hands of commercial manufacturers. The Engineer Board has tested some equipment collected in combat and has obtained reports from teams sent abroad for the purpose. Mr. Karstens described German equipment as good in quality but limited in quantity. Both German and Japanese troops employed Berkefeld-candle filters which produced almost complete removal of turbidity and bacteria without the use of coagulants or disinfectants. Only after capturing British diatomite filter units did the Germans make similar equipment; they employed diatomaceous earth blended with activated carbon and also used paper pad filters. The German air force made some use of super- and dechlorination. The majority of potable water was made safe by boiling and palatable by making into coffee or tea.

Japanese equipment is still under study—only their smallest units were provided with coagulating and disinfecting chemicals. Much use was made of rain water. It is apparent that the safety and amount of water furnished to enemy troops did not approach that provided for our forces.

RESIDUAL CHLORINE RECORDING HAS PRACTICAL RESULTS

"Experience in Recording Residual Chlorine in Water," by John R. Baylis, Engineer of Water Purification; H. H. Gerstein, Sanitary Engineer, Dept. of Public Works, and Kenneth E. Damann, Biologist,

Programmers

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South District Filtration Plant, Chicago, Ill.

Residual chlorine indicating and recording instruments developed by Wallace and Tiernan Co., Inc., were studied by the Chicago staff in cooperation with the manufacturer in 1942-43. Three such instruments were installed in the city in 1944 and one of these units was transferred to the new South District Filtration Plant when that was started in operation in 1945. Ten additional instruments have since been ordered and will shortly be installed.

In operation, the device depends upon changes in the flow of electric current, between a silver anode and a copper cathode, which is induced by varying concentrations of residual chlorine in the water. The current is transmitted from the cell to a micro-max recorder, which may be located at a considerable distance from the cell (the distance is 1,600 feet at one of the Chicago installations). About one liter of water per minute must pass through the cell and the equipment is adjusted to record chlorine residuals ranging from 0 to 10 pounds per million gallons.

Frequent calibration of the instruments is required, to compensate for loss of sensitivity due to electrode deterioration, for temperature and pH variations. Free residual chlorine is indicated and recorded with a higher degree of accuracy than is combined residual chlorine.

In addition to providing a continuous and permanent record of chlorine residuals, this equipment makes it apparent when changes occur in chlorine demand of the water, when chlorinators fail to operate, and when ammonia is added to the water. This paper was illus-

trated with charts from daily operations which recorded interruptions in chlorination, the formation of chloramines, dechlorination due to ammonia, and the variations in chlorine demand which would not be discovered by intermittent testing.

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"Observations as to Performance of Water Sedimentation Basins," by J. D. Walker, Chief Engineer, Process Engineering Division, The American Well Works, Aurora, Ill.

Increased construction and operating costs have intensified the desirability for maximum efficiency or minimum size of settling units, especially in the treatment of industrial wastes. Mr. Walker described studies involving the use of dyes, aluminum powder, or chlorides to determine the movement of liquid through basins. Calcium chloride has been found superior to sodium chloride since it provides a sharper end-point in titrations.

Water has been found to move erratically in masses rather than show uniform displacement. Improperly placed baffles, especially solid vertical baffles at influent ends of tanks, have undesirable effects. Baffles having large holes for distribution give more uniform results. Vertical flow units show much greater uniformity of distribution than do horizontal flow tanks. Density currents are set up in some short-period sedimentation devices and indicate that where a heavy slurry is handled, better results are obtained by providing a forebay for preliminary settling. Effluent weirs must be of adequate length to prevent rising sludge. Units providing 60 to 90 minutes detention may now be designed to be equal in efficiency to older units providing 6 to 8 hours' detention.

A double-flow horizontal sedimentation tank installed at Burlington, Iowa, designed to take advantage of these careful studies, shows 90 per cent efficiency in a 1.5 hour detention period. It is apparent that many overloaded or outmoded sedimentation units could be modified, usually by redesign of influent and effluent baffles, to increase their efficiency from 30 to 90 per cent.

"Iron Salts as Coagulants," by J. E. Kerslake, Supt. of Filtration; E. C. Schmitt, Asst. Supt.; and N. A. Thomas, Chief Chemist; Water Purification Plant, Milwaukee, Wis.

General experience with iron compounds as coagulants, their advantages and disadvantages, and the results of plant scale studies at Milwaukee, were included in this paper presented by Mr. Kerslake. The U. S. Public Health Survey of 1940 shows 88 filtration plants, out of a total of 1,688, to use iron coagulants, usually in combination with lime and sometimes with alum. Suitable feeding equipment must be provided, since solutions of the iron salts are corrosive.

Ferric iron salts will form floc over a wide pH range; they are especially useful for the coagulation of iron and manganese, and the floc is tenacious. Ferric iron can be reduced to ferrous—every precaution should be taken to prevent this, and prechlorination is effective for such a purpose. Silicates have not been found generally helpful in improving coagulation with iron salts. Plant scale operation can frequently be maintained at its greatest efficiency and economy by control on the basis of laboratory jar tests.

Coagulation studies at the Milwaukee Filtration Plant showed that ferric sulfate could be used instead of alum as the coagulant. Half of the water handled was treated with alum and half was treated with a dosage of iron coagulant equivalent in cost to the alum dose found effective. Advantages found with the iron treatment were slightly longer filter runs and better removal of micro-organisms. It was pointed out that the iron floc discharged in filter backwashing may create undesirable conditions if discharged in a conspicuous location.

Extended discussion followed the presentation of this paper, originating with the comment by N. J. Howard, Toronto, that expenditures to reduce the turbidity of water below 0.5 ppm. are not justifiable. Mr. Kerslake maintained that Milwaukee pays only $1.50 per million gallons to provide an even better water than specified by Mr. Howard (the Milwaukee standard is 0.05 ppm. turbidity) and this cost did not appear excessive. Mr. Baylis, Chicago, said the cost of water to consumers is so low that water quality should be the highest possible. Messrs. McCarthy, Racine, and Powell, Hackensack, pointed out that coagulation to reduce turbidity would accomplish greater insurance of bacterial removal and would protect against tastes and odors in distribution systems. Marsden Smith, Richmond, emphasized that good preparation and filtration of water is essential to the preservation of satisfactory water quality out in the distribution system, while Mr. Hartung, St. Louis County, indicated that dead-end troubles bear a direct relationship to the effectiveness of coagulation and filtration. In concluding the discussion, Mr. Howard expressed the belief that adequate and uninterrupted chlorination could control bacterial deterioration, but that there was still much to learn concerning the checking of depreciation of water in distribution systems.

"Water and Water Treatment in Florida—A Motion Picture," presented by C. F. Wertz,* Resident Engineer, Dept. Water and Sewers, Miami, Fla.

The Florida section of the A. W. W. A. conceived the idea, in 1940, of producing a motion picture to show the water filtration and treatment plants in that state; the section has spent about five hundred dollars on the project to date. Mr. Wertz provided a running commentary to accompany the colorful scenes which include plants at Fort Lauderdale, Gainesville, West Palm Beach, Miami, and many more. The motion picture has been planned to illustrate not only treatment methods, but laboratory procedures as well, so that it may serve for the instruction of plant operators. The film may suggest that other sections could carry out a similar project to good advantage.

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MANGANESE REMOVAL BY BREAK-POINT CHLORINATION*

Experiences at Montebello Filters, Baltimore, Md.

By S. E. EDWARDS and G. B. McCALL
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THE excessive presence of manganese in the raw water at Montebello Filters, Baltimore, Md., is a seasonal condition occurring from July through October. The usual procedure to cope with this condition is to substitute ferrous sulphate and lime as a coagulant (instead of alum) with a resultant pH of 9.0 for the coagulated water. Because of the inability to obtain satisfactory shipments of ferrous sulphate in 1943, it was imperative to find another method of manganese removal, so that the quality of water to the consumer would be unimpaired.

This problem of manganese removal had been recognized elsewhere. Erickson and Veatch[1] reported the use of chlorination, aeration, and a contact bed before filtration to remove manganese. Thirty-five per cent of raw water manganese was removed by the contact beds, fifteen per cent in the settling basin and forty-five per cent on the final sand filters, making a total removal of ninety-five per cent. Zapffe[2] passed water upward through pyrolusite (containing 70% MnO_2) and sprayed the overflow on coke beds. Here the manganous hydroxide formed by catalysis, is, in the presence of excess air, or oxygen, converted to stable manganic hydroxide and manganese dioxide. Montebello Filters does not have aeration or contact beds but by the use of chlorine as an oxidizer and the sand filters as a contact bed we assumed that the manganese could be removed. The basis for this assumption was derived from the experience of removing a small quantity of manganese from the water in the winter of 1944.

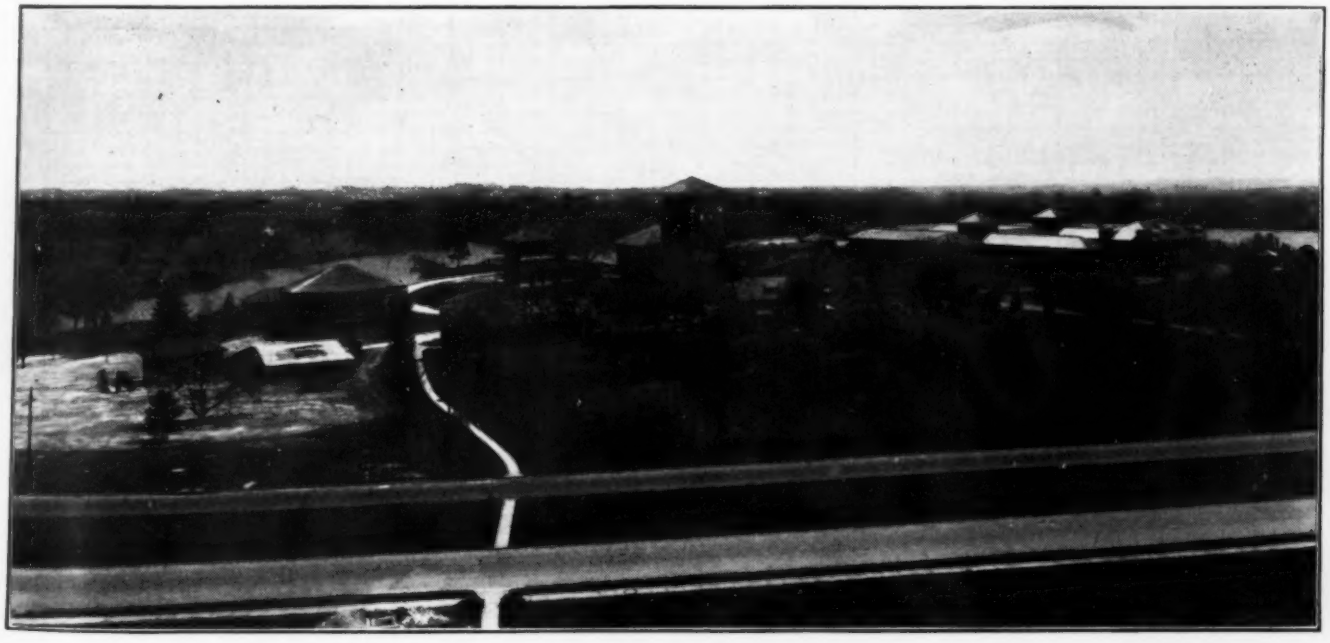
*A paper read before the Md.-Del. Water and Sewage Works Assn. and printed by permission of the Association.

Early 1944 Experience Pointed the Way

During January 1944, the daily average applied chlorine dose was 1.57 p.p.m. and the residual chlorine in the filter effluent was 0.31 p.p.m. In order to conserve chlorine, the applied dose was reduced to 0.94 p.p.m. in February and 0.78 p.p.m. in March. Although the chlorine residual in the filter effluent for February and March corresponded to that of January, the time required to obtain this residual reading with o-tolidine was ten minutes instead of an instantaneous reading as in January. The explanation was found in the fact that the reduction of the chlorine dose below 1.00 p.p.m. permitted manganese which was then present in the raw water to pass the filters and appear in the filtered water to the extent of 0.10 p.p.m.

To ascertain the reason for the increased time required to obtain the chlorine residual and the presence of manganese in the filtered water, o-Tolidine-Arsenite[3] tests were conducted. These tests showed the residual to be 0.05 p.p.m. free chlorine and 0.25 p.p.m. chloramines. The results of these tests indicated that an increase in applied chlorine was necessary to obtain a true free chlorine residual.

The applied chlorine, therefore, was increased gradually from 0.8 p.p.m. to 1.8 p.p.m. This caused a decrease at first and then an increase in the chlorine residual, thus indicating the break-point had been reached. This fact was confirmed



Montebello Filters, Baltimore, Md.
Scene of the Annual Manganese Battle

by the presence of 0.30 p.p.m. free chlorine and only 0.04 p.p.m. chloramines in the filtered water. We found the increase in the free chlorine residual was accompanied by a reduction of the manganese in the filtered water to zero. The elimination in March of this small quantity of manganese by the use of break-point chlorination made it seem logical that the larger quantities encountered during August, September and October each year could also be eliminated by heavy chlorination.

The Manganese Battle Starts in July

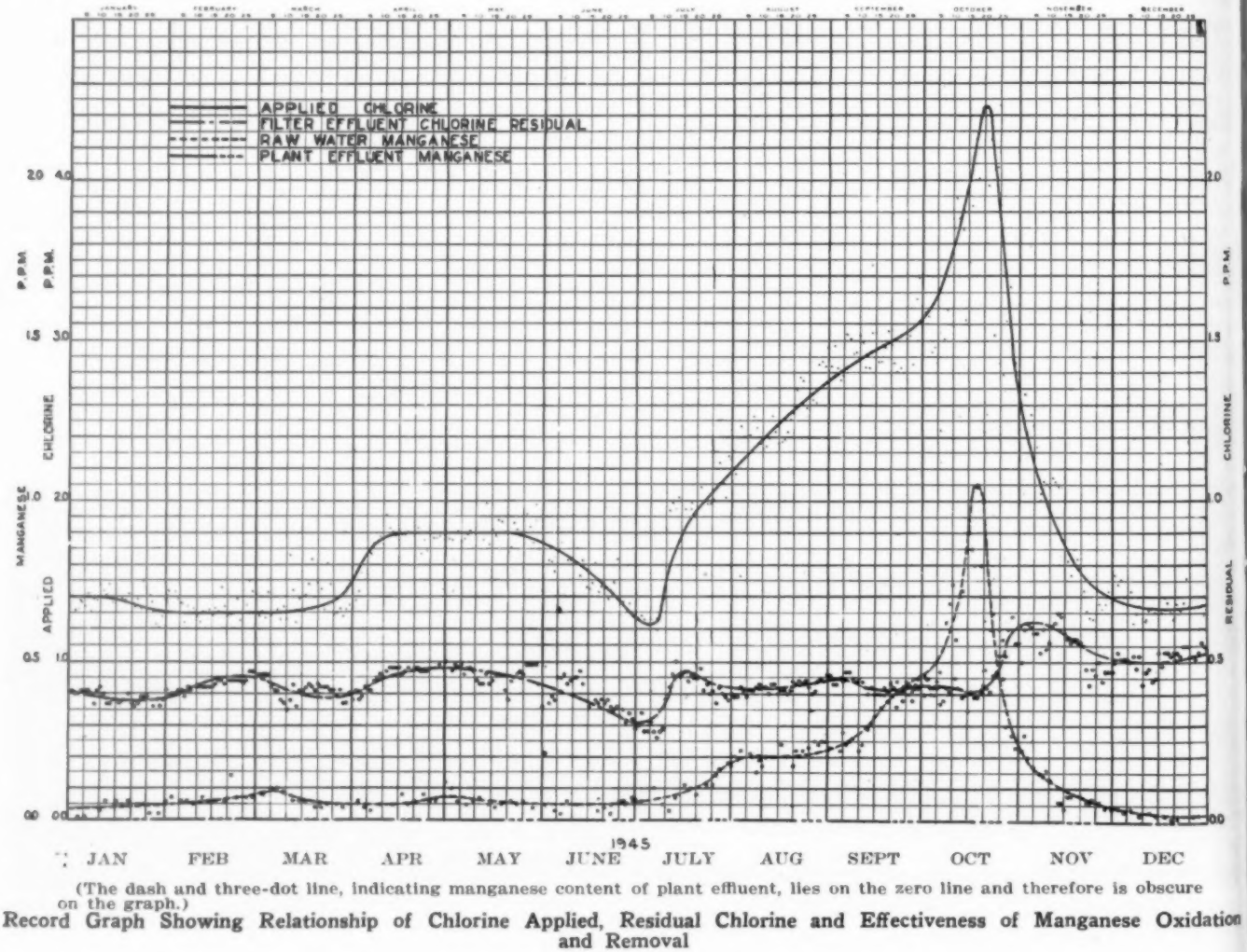
The manganese in the raw water began to increase on July 10, 1944 and continued until October 21, 1944, at which time a maximum of 1.75 p.p.m. was recorded. The control procedure was to apply sufficient chlorine to maintain a true free chlorine residual of 0.4 p.p.m. to 0.5 p.p.m. at the effluent of the filters. On September 27, 1944 the chlorine residual at the filter effluent dropped below 0.4 p.p.m. and by October 13, 1944, reached 0.19 p.p.m., even though the applied chlorine dose was 2.6 p.p.m. The effect of the low chlorine residual was to permit an increase in the manganese in the filtered water from 0.0 p.p.m. to 0.15 p.p.m. It was impossible to apply additional chlorine because we had reached the limit of our capacity, and our chlorine shipments were delayed.

During the next twenty-three days, the critical manganese period, it was necessary to use the ferrous sulphate and lime treatment for the manganese removal. This critical manganese period occurred at the time of "turnover" of the water in the impounding reservoir. The applied chlorine was 2.25 p.p.m. and the chlorine residual in the filter effluent was 0.45 p.p.m.—of this, only 0.10 p.p.m. was free chlorine and 0.35 p.p.m. was chloramines. Because of this change in ratio of free chlorine to chloramines during the "critical manganese period," objectionable tastes were present due to algae. This condition was corrected by the use of activated carbon. By November 10, 1944 the manganese in the raw water had decreased to 0.01 p.p.m., therefore, at this time the ferrous sulphate and lime treatment was terminated and the alum treatment restored.

1945 Procedure Completely Successful

This experience of 1944 definitely proved our assumption that if sufficient chlorine were applied the manganese could be removed. It was, therefore, decided to continue the experiment during 1945. The manganese in the raw water, as in previous years, began to increase July 10, 1945, continuing until a maximum of 1.05 p.p.m. was reached on October 20, 1945. In addition to the regular chlorine equipment, three Rotameters — two of 2,000 pounds per day capacity and one of 6,000 pounds per day capacity—enabled us to apply 4.5 p.p.m. of chlorine. This was sufficient chlorine to maintain a true chlorine residual of 0.4 p.p.m. in the filter effluent, and to give the consumer a water which was free of manganese for the entire year. The chlorine-manganese relation for 1945 is shown in the accompanying graph.

Tests were made of the effluents of the settling basin, the filters, and the clear water reservoir to ascertain the reduction of manganese



(The dash and three-dot line, indicating manganese content of plant effluent, lies on the zero line and therefore is obscure on the graph.)

Record Graph Showing Relationship of Chlorine Applied, Residual Chlorine and Effectiveness of Manganese Oxidation and Removal

through the plant. The results for the year 1945 were 25 per cent raw water manganese removal in the mixing and settling basins and 75 per cent removal by the sand filters, giving a total removal of 100 per cent. Some of the actual removal was due to the catalysis caused by the manganese coated sand grains.

To prove catalysis was responsible for some of the manganese removal an experiment was conducted in a small glass filter. This glass filter was prepared by filling a glass tube six feet long and two and a half inches in diameter with six inches of gravel and eighteen inches of manganese coated sand from a plant filter. Raw water (without any treatment whatsoever) containing 0.5 p.p.m. manganese was run through this filter at a rate of two gallons per square foot per minute. This test showed complete removal of the raw water manganese for twenty-four to thirty-six hours after which time manganese was present in the effluent. This demonstrated that catalytic action of the sand had ceased. The filter was then turned off and a strong chlorine solution applied to the sand. Following this, the sand was thoroughly washed with tap water to remove the chlorine. Raw water was again run through this filter and the effluent was free of manganese for another 24 to 36 hours. The chlorine had thus reactivated the sand so that catalysis could be resumed.

Effect on Tastes and Bacterial Quality

Accompanying the manganese removal by break-point chlorination was a decrease in bacteria and a most gratifying decline in taste complaints. The 1940 bacteriological record for the plant effluent of the presumptive lactose tubes was 1.1 per cent positive in the 1 cc. portions and 13.0 per cent positive in the 10 cc. portions, whereas, the 1945 record for the presumptive lactose tubes was 0.0 per cent positive in the 1 cc. portions and 0.3 per cent in the 10 cc. portions. The confirmative lactose tests for 1940 were 0.3 per cent in the 1 cc. portions and 0.9 per cent in the 10 cc. portions while those of 1945 were 0.0 per cent in both the 1 cc. and 10 cc. portions. These results are shown in Table 1. The bacteriological quality of the raw water for 1945 was poorer than for 1940. Therefore, this improvement in bacteriological results must be attributed entirely to the increase of applied chlorine and the fact that a true free chlorine residual could be maintained.

TABLE 1

Bacteriological Record Plant Effluent

	Presumptive Test % Positive		Confirmative Test % Positive	
YEAR	1 cc.	10 cc.	1 cc.	10 cc.
1940.....	1.1	13.0	0.3	0.9
1941.....	0.4	10.2	0.0	0.2
1942.....	2.5	19.0	0.0	0.1
1943.....	0.6	8.5	0.0	0.1
1944.....	1.0	7.5	0.0	0.0
1945.....	0.0	0.3	0.0	0.0

The use of chlorine residual above 0.25 p.p.m. had heretofore been considered unwise because of objectionable taste. This fact has been disproved at Montebello Filters where chlorine residuals as high as 0.60 p.p.m. have been recorded without any complaints from the consumer. The increase in chlorine residual from an average of 0.17 p.p.m. in 1940 to an average of 0.37 p.p.m. in 1945 has decreased correspondingly the complaints of objectionable tastes. (See Table 2.)

TABLE 2

Year	Number of Taste Complaints	Avg. Residual Chlorine p.p.m.
1940.....	516	0.17
1941.....	133	0.19
1942.....	60	0.22
1943.....	28	0.26
1944.....	30	0.36
1945.....	0	0.37

A Comparison of Costs

The chemical cost for the removal of manganese from the raw water by break-point chlorination was also considered. Since the water quality in 1939 was more nearly that of 1945 these years were chosen for comparing costs. The cost of chemicals used in September and October 1939 was compared with chemical costs for the same months of 1945. As stated above, the treatment formerly employed at the Montebello Filters for manganese removal was the use of ferrous sulphate and lime. Furthermore, since September and October are the months of excessive manganese it was decided that better cost comparison could be made by using these months as a basis. It was found that coagulation costs were comparable for either alum or ferrous sulphate and lime when local prices for these chemicals were used. The difference in cost of the two methods lay in the fact that activated carbon was necessary with the ferrous sulphate and lime treatment but not with the break-point chlorination. As shown in table 3 an average of 6.51 pounds of chlorine per mil. gals. and 16.64 pounds of activated carbon per mil. gals. were used in 1939, while 26.60 pounds of chlorine per mil. gals. and 0.0 pounds of carbon were used in 1945. Using a price of 4 cents per pound for carbon and 2.4 cents per pound for chlorine made the cost of carbon and chlorine 82 cents per mil. gals. in 1939. The cost of break-point chlorination in 1945 was only 64 cents per mil. gals. This was a difference of 18 cents per mil. gals., a saving of 22 per cent by using the break-point chlorination method for manganese removal.

Conclusions

In summary, the following conclusions have been reached at Montebello Filters:

1. A water whose residual is chiefly chloramines requires a longer time to obtain an o-tolidine reading than one whose residual is free chlorine.
2. Increasing the applied chlorine past the break-point gives a true free chlorine residual.
3. This free chlorine has the following effects: elimination of manganese, improved bacteriological record, and a decline in taste complaints.
4. Catalysis of the manganese coated sand in the filters is responsible in part for the complete manganese removal.
5. Break-point chlorination is more economical than the ferrous sulphate-lime treatment and far simpler.
6. Break-point chlorination eliminates the use of activated carbon.

Therefore, we have found when break-point chlorination with a free chlorine residual of 0.40 p.p.m. is maintained in the filter effluent, the raw water manganese can be entirely removed by the Montebello Filters.

References

1. Veatch & Erickson, *J.A.W.W.A.*, 29:12, 1896 (Dec., 1937).
2. Zapffe, *J.A.W.W.A.*, 25:5, 655 (May, 1933).
3. Hallinan, *J.A.W.W.A.*, 36:3, 296 (March, 1944).

TABLE 3

MONTH	Raw Water Manganese p.p.m. 1939	1945	Chemicals—Pounds Per Million Gallons: Alum 1939	1945	Ferrous Sulphate 1939	1945	Lime 1939	1945	Chlorine 1939	1945	Carbon 1939	1945
September	0.26 to 0.67	0.22 to 0.45	0	6.34	9.67	0	9.26	4.50	6.17	24.60	14.93	0.00
October	0.28 to 1.05	0.23 to 1.05	0	6.26	10.67	0	9.17	5.34	6.84	28.60	18.35	0.00
Average	...	...	0	6.30	10.17	0	9.22	4.92	6.51	26.60	16.64	0.00

CHART FOR DETERMINATION OF EQUIVALENT PIPES

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THE use of "flow resistance factors" has become widespread in the calculation of the loss of head in pipes and pipe networks, particularly in the Hardy Cross method of analysis. Through the use of flow resistance factors and the accompanying chart, the determination of equivalent pipes can be performed very easily, and in a manner working in very well with the usual beginning of a Hardy Cross analysis.

Explanation

Pipes with the same flow resistance factor will have the same loss of head at the same discharge and are therefore equivalent. Flow resistance factors are obtained by placing any of the common formulas for the flow of water in pipes in the form:

$$h = rQ^n \qquad \text{(Eq. 1)}$$

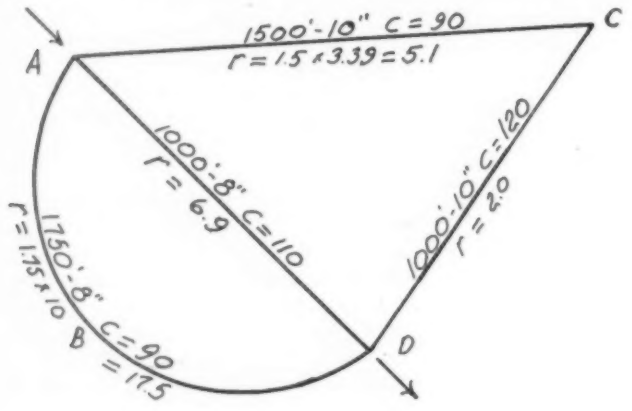
where r is the flow resistance factor, h is the head lost due to a discharge Q, and n a coefficient of the particular formula. In this form the Hazen and Williams formula becomes:

$$h = rQ^{1.85}$$

In the Hazen and Williams formula if the head loss, h, is expressed in feet per 1,000 feet of pipe, the diameter of the pipe, D, in feet, and the discharge, Q, in gallons per minute, then

$$r \times 10^5 = \frac{5796\ .\ 9047}{C^{1.852}\ D^{4.87}} \qquad \text{(Eq. 2)}$$

where C is the Hazen and Williams coefficient. From this



Pipe Loop Diagram

expression values of r per 1,000 feet of pipe can be calculated for any size and roughness of pipe. A table of values for the flow resistance factor, computed from Equation 2, is given in Table I. Tables of values of r for Q or h in other units can easily be computed.

It can readily be demonstrated that the r value of a pipe equivalent in carrying capacity to two or more other parallel pipes has the relationship to the r values of other pipes shown in the following equation:

$$\frac{1}{r^{p_o}} = \frac{1}{r^{p_1}} + \frac{1}{r^{p_2}} + \ldots\ldots \frac{1}{r^{p_n}} \qquad \text{(Eq. 3)}$$

In this equation n is the total number of distinct parallel pipe lines including pipes 1 and 2, to which pipe "o" is equivalent, and p is a coefficient whose value depends upon the pipe-flow formula on which Equation (3) is based. The solution of Equation (3), with p given the value of 0.54 from the Hazen and Williams equation, is simplified through use of the accompanying chart. This chart can be used with values of r from Table I for the rapid determination of equivalent pipes. The chart can be used with equal facility in conjunction with any other tables of r, as long as these tables are based upon the Hazen and Williams formula. It will be observed that the position of the decimal point can be switched at will in using the chart, as long as each r value is operated upon by the same power of ten.

TABLE I.

Values of Flow Resistance Factor x 10^5
For 1,000 ft. of Main with Q in gpm.

Pipe Diam.	C 80	90	100	110	120	130	140
4 in. ..	365.0	293.4	241.4	202.4	172.2	148.5	129.5
6 in. ..	50.7	40.7	33.5	28.1	23.9	20.6	18.0
8 in. ..	12.5	10.0	8.26	6.92	5.89	5.08	4.43
10 in. ..	4.21	3.39	2.79	2.33	1.99	1.71	1.49
12 in. ..	1.73	1.39	1.15	0.961	0.818	0.705	0.615
14 in. ..	0.818	0.658	0.541	0.453	0.386	0.333	0.290
16 in. ..	0.427	0.343	0.282	0.237	0.201	0.174	0.151
18 in. ..	0.240	0.193	0.159	0.133	0.113	0.0979	0.0853
20 in. ..	0.144	0.116	0.0952	0.0798	0.0679	0.0586	0.0511
24 in. ..	0.0592	0.0476	0.0392	0.0329	0.0280	0.0241	0.0210
30 in. ..	0.0200	0.0161	0.0132	0.0111	0.0094	0.0081	0.0071

Example

The use of the chart will be demonstrated by the determination of a pipe equivalent to the three pipe lines shown in the accompanying diagram. Flow resistance factors were obtained from Table I.

The total flow resistance factor for ACD is of course 5.1 + 2.01 or 7.1. (The factor 10^5 can be dropped here since we will automatically pick it up again when we reenter the table with the r value of our equivalent pipe.) A line drawn on the chart connecting the values of 7.1 and 17.5 indicates that a pipe equivalent to ACD and ABC has a flow resistance factor of about 2.9. Similarly a pipe equivalent to ACD, AD, and ABD, is determined to have a flow resistance factor of 1.2. A length of any pipe with this flow resistance factor will then be equivalent in carrying capacity to the system of pipes shown in the diagram, as for instance $\frac{1.2}{1.15}$ x 1,000, or 1,040 ft. of 12 in. pipe with C of 100; $\frac{1.2}{0.24}$ x 1,000 or 5,000 ft. of 18 in. pipe with C of 80; or, $\frac{1.2}{8.26}$ x 1,000 or 145 ft. of 8 in. pipe with C of 100.

In the solution of problems of this sort the value of the Hazen and Williams coefficient C is usually not accurately known. The diagram will therefore usually furnish figures with all justifiable exactness. The values of the chart are marked off according to the scale equation $x = mu^{0.54}$, where m is the scale modulus, taken as 1.44 inches. If greater accuracy were desired the scale modulus could be taken as 2 or even 3 inches and the scales extended. The axes of the chart intersect at an angle of sixty degrees.

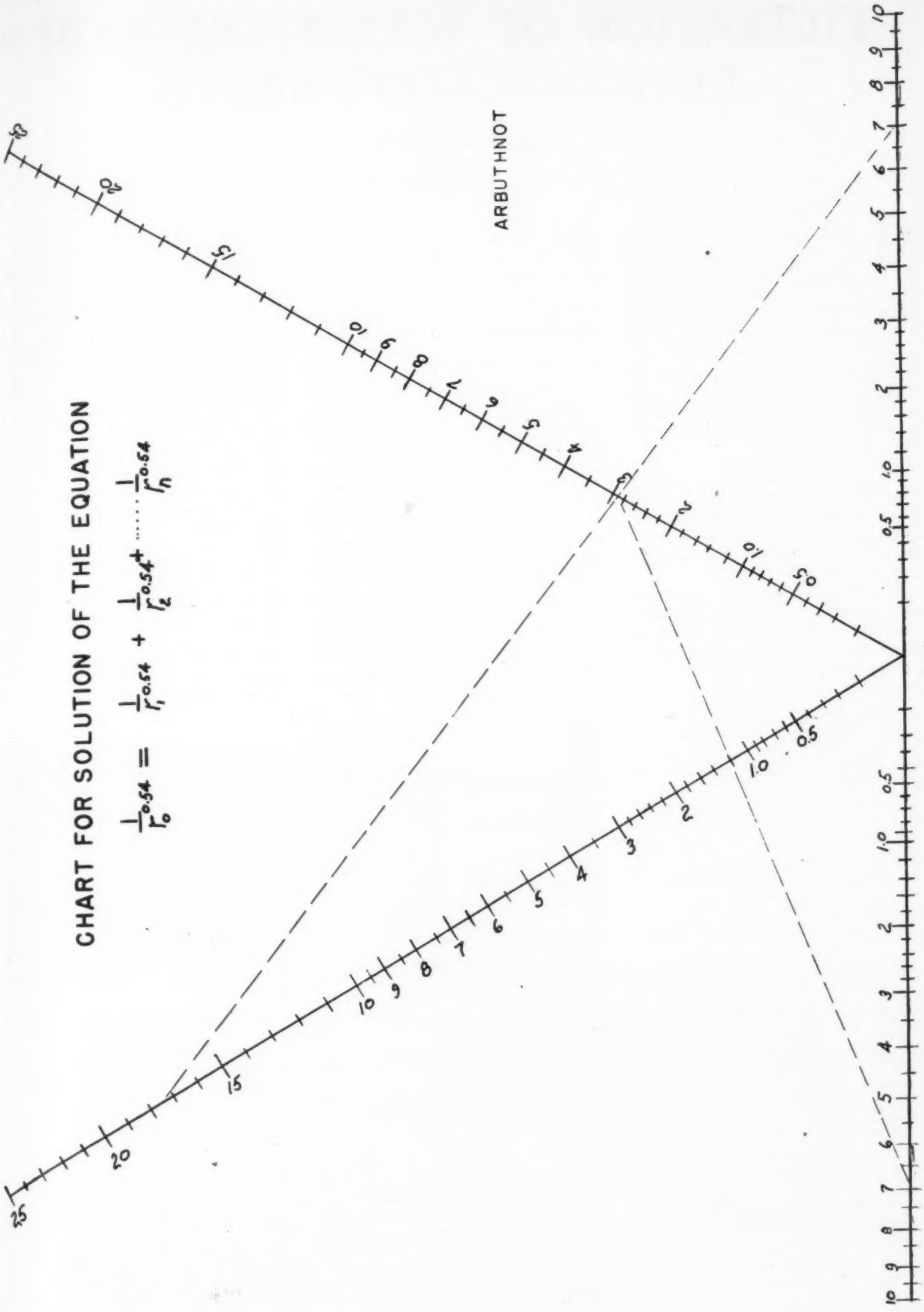


Chart for Determination of Equivalent Pipes

FILTRATION OF WATER THROUGH DIATOMACEOUS EARTH

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MANY scientific advances made for military purposes will find application for civilian use. Filtration of water through diatomaceous earth is a typical example.

During the first few years of the war the drinking water for our troops was purified in the main by chlorination together with pressure sand filtration often supplemented by coagulation. Two sizes of units were generally employed:

1. A portable sand filter, carried by several men, having a capacity of 10 gpm. and weighing (inclusive of a separate treatment section of pump, chlorinator, coagulant, feeders, etc.) approximately 800 lb.

2. A mobile sand filter and accessories, mounted on a truck, having a capacity of 75 gpm., and weighing about 4900 lb. on skids and 16,645 lb. truck mounted.

As Captain Black and Mr. Charles Spaulding have reported in previous papers,[1,2] excessive filter rates were employed and the water was usually inadequately pretreated ahead of the filters. This was presumably the result of the urgent need for the maximum of water output per unit of weight of equipment. Consequently, instead of operating the sand filters at conservative ratings of 2 to 3 gpm. per sq. ft. of filter area, rates up to 12 gpm. per sq. ft. were employed. Obviously, the clarity of the filtered effluent suffered and reliance had to be placed mainly on chlorination for potability. Investigations made by the Engineer Board, National Institute of Health, and the U. S. Public Health Service showed the need of lower filter rates and greater care in pre-coagulation.

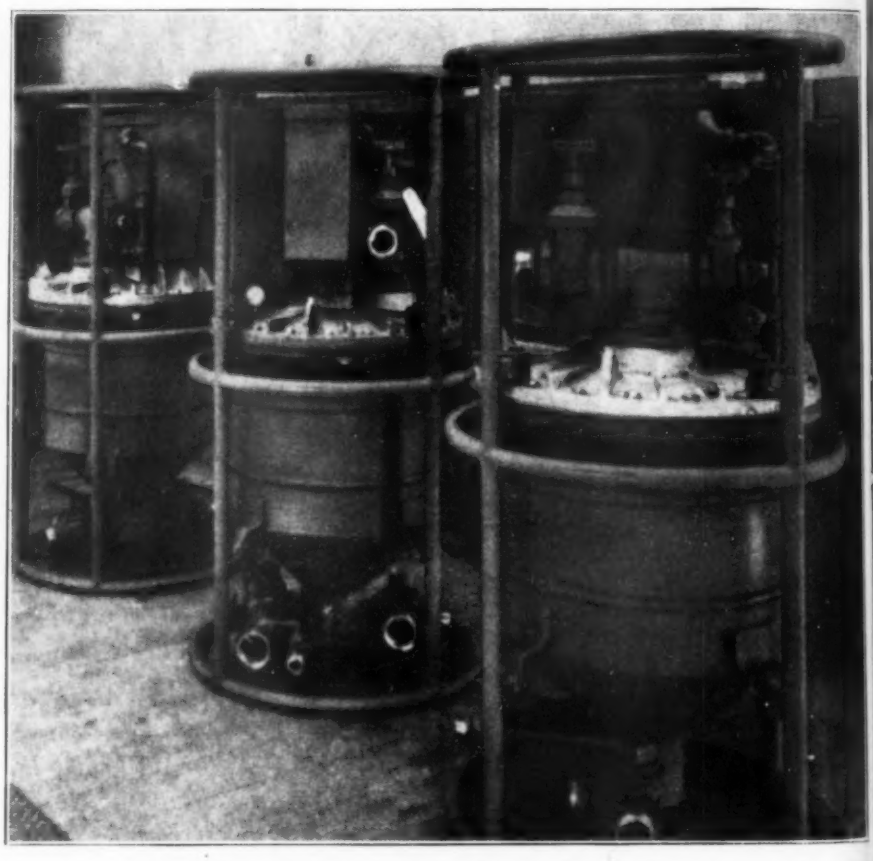
Furthermore, in many locations organisms were encountered which not only passed the sand filters but also resisted chlorination. Typical examples were the cysts of Endamoeba Histolytica which cause amoebic dysentery, and Cercariae, the causative agent of Schistosomiasis. As a result, investigations were started by the Engineer Board in 1943 to determine the feasibility of diatomite filtration to replace the sand filters. Diatomite filtration had been in use for over 20 years in the chemical industry and was in use for water filtration in the British Army.

Diatomite Filters

Diatomaceous earth, which is largely silica, is found in deposits mainly along the Pacific Coast and consists of the skeletons of diatoms that were deposited on the bottom of bays or other similar bodies of water. These deposits frequently became exposed by the lifting of these areas above sea level so that mining operations could be carried out. The mined products are crushed, classified and treated (often by calcination) to give the well-known filter-aids of various sizes. The grain size of diatomite is usually only 1/50 to 1/600 of the size of filter sand granules, so that the filtration effect by mechanical straining would obviously be expected to be superior to sand even if relatively thin layers of the diatomite of only a fraction of an inch in thickness were employed.

In order to design a practical filter for army use, the investigation had to explore the various sizes and types of diatomite which were available, the pressure losses to be expected, the filter rates that could be used and the mechanics of forming the filtering layer, maintaining it in good condition, and backwashing it.

At first the endeavor was to filter the surface supply directly by the filter. This would have made for the simplest design. But it was soon found that the filter runs were usually too short if reasonable pressure losses were employed. The character of the suspended matter in the water was the controlling factor. If organic slimes were present even in small amount, the diatomite became



Three Views of Portable Unit—Capacity 50 gpm.

*Formerly Vice-Pres. The Permutit Co.

Pack Unit—Capacity 15 gpm.
(Half of unit weight 50 lb.—other half consisting of pump and engine, weight 60 lb.)

quickly clogged. On the other hand, granular inorganic matter would give much longer filter runs even if present in relatively larger amount. It was therefore decided to pretreat the water in batch canvas tanks, adding calcium hypochlorite and coagulants so as to produce a water which would give higher outputs. Also greater reliability of removal of pathogenic organisms (gas formers) was obtained whenever pretreatment was employed. But if the surface supply was relatively clear to start with, direct filtration could be employed without pretreatment.

With pretreatment it was also found possible to use the coarser sizes of diatomite and standardization of the entire procedure could be worked out to fit a great variety of waters.

Precoating

The problem of producing the filtering layer or cake of diatomite and of maintaining it in the most permeable condition possible received considerable study. The initial application of diatomite, called "precoating," was quite generally known in chemical industry. But there was some difference of opinion as to the necessity of adding more diatomite during the progress of the filter run, called "body-feeding." The British practice seemed to frown on it, presumably due to the complication involved. But it was soon found that unless body-feeding was adopted as a standard (except for relatively clear raw waters), filter runs would be too short and the amount of diatomite used per unit of volume of filtered water produced would be excessive. The precoat tends to become slimed over and sealed by the dirt removed from the water unless body-feeding is practiced. The latter tends to keep the cake relatively porous and permeable.

Before determining the final form and design of the standard filter to be adopted, several manufacturers of water conditioning equipment were invited to fabricate and submit models of filters for test. They were encouraged to make original designs that would be simple, with a minimum of valves and moving parts, rugged, compact, the lightest possible in weight and easiest to operate under unfavorable field conditions for military application. A variety of models were thus obtained and tested. The manufacturer whose model came closest to meeting the desired characteristics was then invited to cooperate in working out the details of the final design.

The filter, in general, consisted of a vertical cylindrical shell with a conical bottom and with a horizontal tube sheet held in the flanged joint of the top head. From this tube sheet were suspended the tubular filter elements on which the diatomite cake was formed. These filter elements were made either of porous aloxite or carbon or helically wound wire on a plastic core, or porous rubber sheet wrapped on a brass perforated cylinder covered by wire. The water flow was upward during filtration and downward during backwashing.

Two mechanical problems received considerable attention:

(1) Body Feeding; (2) Backwashing.

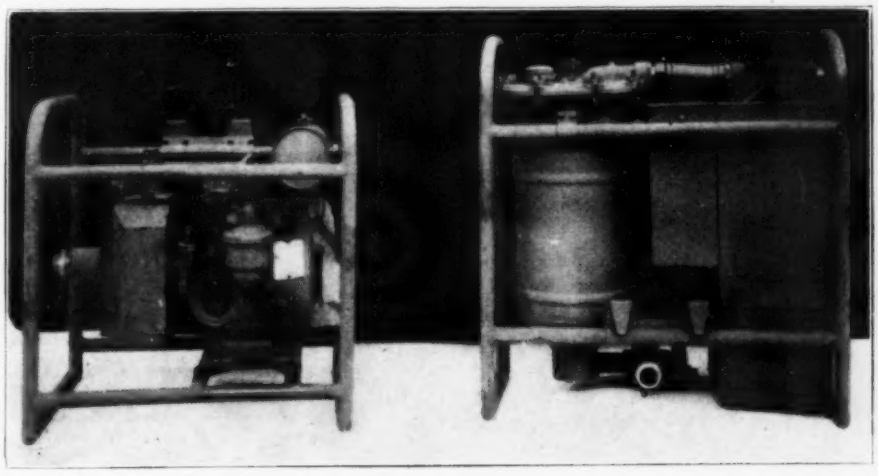
Body-feeding

Body-feeding involved first finding a fool-proof agitator to keep the diatomite suspended homogeneously in a slurry. Diatomite settles readily and considerable agitation was required to suspend it. No electric motor was available to drive a high speed propeller. Mechanical drives from the gasoline engine that operated the pump could be used but that was too inflexible, especially when it was later decided to separate the pump assembly from the filter assembly. The solution was the use of a water-motor using a minimum of water flow and pressure to accomplish the agitation.

Then the proportioning of the amount of the diatomite fed to the varying flow of water through the filter had to be developed. As the filter head loss rises, the centrifugal pump discharge falls off. If the slurry feed were constant in flow, the dosage would increase too rapidly as the run progresses. To keep the filter water flow constant would involve a rate of flow controller which was to be avoided. The solution was to decrease the rate of feeding the diatomite as the water rate decreases.

A neat design was worked out for diluting the slurry at a constant rate by introducing a constant stream of water into the slurry tank which was kept full. The diluting stream also acted as the displacement stream so that a constant flow of slurry of continuously decreasing strength was fed to the water. By using calculus it was possible to work out a formula showing that the dosage of diatomite was quite proportional to the continually decreasing flow rate from the centrifugal pump.

Feeding the slurry by gravity into the water pump suction avoided the use of separate pumps for feeding the diatomite and the resultant problems of pump erosion that would have been caused by the siliceous and jagged diatomite. But a suitable



Pack Unit—Filter Area 3.6 sq. ft.
Left, pump and engine; right, filter unit.

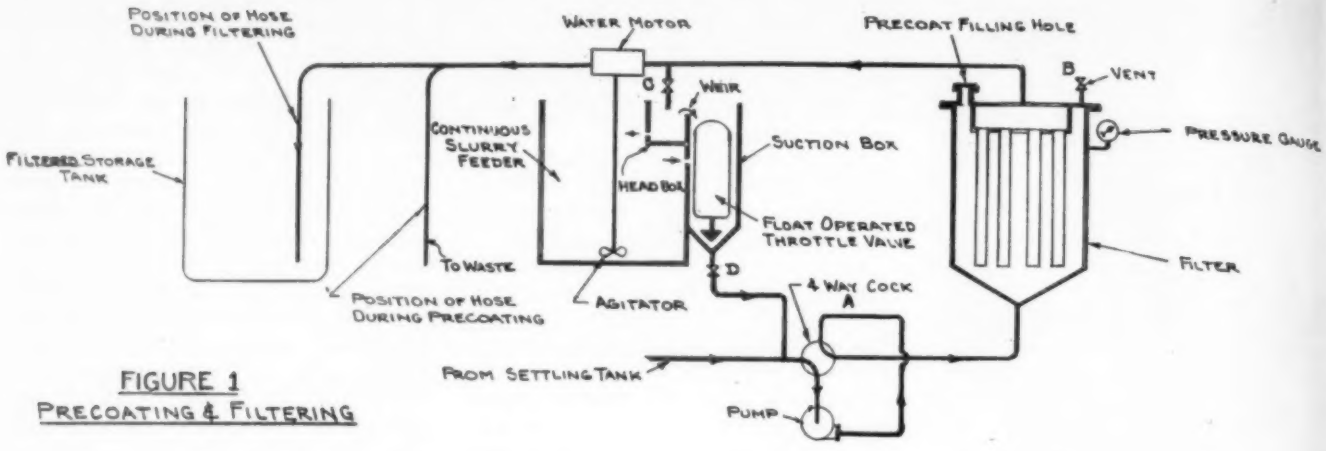


FIGURE 1
PRECOATING & FILTERING

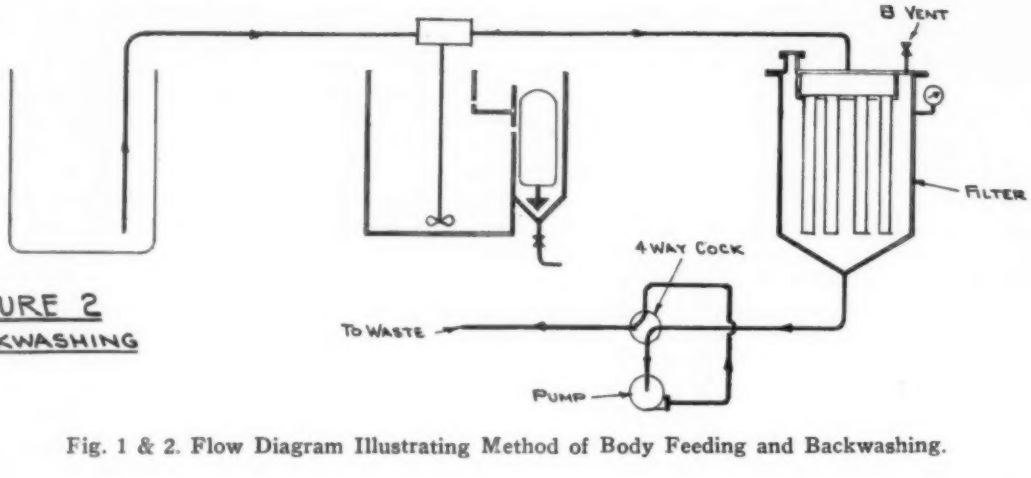


FIGURE 2
BACKWASHING

Fig. 1 & 2. Flow Diagram Illustrating Method of Body Feeding and Backwashing.

pump suction tank had to be devised to avoid drawing in air.

Backwashing

Backwashing could have been done with either raw water or filtered water. The latter was preferred so that the filter shell would be filled with filtered water when precoating again took place. A simple method was finally developed of drawing filtered water back through the filter and out through the pump to waste. This accomplished the backwashing with a minimum of valve operation and in less than one minute and with a waste of water of usually less than 2 per cent of the filter output.

Two standard units were finally produced. One was a pack filter of 3.6 sq. ft. of filter area with a capacity of 15 gpm. weighing about 50 lb. The pump and engine unit weighed 60 lb. The second was a portable filter of 10 sq. ft. of filter area, with a capacity of 50 gpm. weighing about 350 lb. The pump and engine unit weighed 167 lb.

The accompanying figures show the pack unit and the portable unit. Figs. 1 and 2 show a flow diagram and illustrate the method of body feeding and backwashing adopted.

The application of diatomite filters for civilian water filtration may, of course, permit improvements on the Army units because of the less stringent conditions to be encountered. Electricity will be available for slurry agitation. Arrangements for pack or other handling and transportation will not be needed. But the general features developed will find direct application.

Great interest has been aroused in the future possibilities of this new method and technique of super-filtration wherever the utmost in removal of bacteria is essential. Boards of Health will undoubtedly welcome it for swimming pool filtration. Also it will find a place in preparation of water for bottling and for drinking purposes in general.

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2. Black, Hayse H., and Spaulding, Chas. H., Diatomite Water Filtration Developed for Field Troops. *Jour. A.W.W.A.*, Vol. 36, pg. 1208 (Nov., 1944).

Acknowledgment: This paper was read before the Division of Water, Sewage and Sanitation Chemistry of the Am. Chemical Society in Atlantic City, N. J., April 9, 1946.

Vanderbilt Appoints L. E. Otts Prof. of San. Engineering

Louis E. Otts, Jr., has been appointed as Asst. Professor of Municipal and Sanitary Engineering at Vanderbilt University, Nashville, Tenn.

Prof. Otts received his B.A. degree from East Texas State Teachers College in 1933 and spent five years teaching in the public schools of Texas. After he returned to Texas A. & M. to study engineering, his studies were interrupted by the war, in which he served as Sanitary Engineer and Supervisor of the sewage treatment plant at Sheppard Field, Wichita Falls, Tex.

Prof. Otts returned to Texas A. & M. last Fall and received his B.S. in Civil Engineering in June of this year. In August he will receive his Master's Degree in Municipal and Sanitary Engineering.

TRAINING OF FILTRATION PLANT PERSONNEL

A. E. CLARK*
Dept. of Public Works
NASHVILLE, TENN.

THE operation of a filtration plant depends on the knowledge and interest of the personnel operating it. It is assumed that the engineer, chemist or superintendent in charge of the plant, whatever his title may be, has the basic education and training in the art of water purification, including laboratory technic and mechanical equipment. In addition to the above, a knowledge of training methods and handling of men is most important.

The operating personnel of a filtration plant is usually made up of operators, helpers, laborers, and depending on the type and size of the plant, a chief operator, a chemist, bacteriologist and assistants and a clerk. The number and classification of employees depends entirely on the type and size of the plant. And, of course, if pumping is included, additional men are usually required.

The training of personnel in any type and size of plant is very important because the uniform results required are directly proportional to the type of operation obtained and to get uniform operation it follows that all operating personnel should be given uniform training. The operating helpers are usually trained to advance to an operator's classification when vacancies occur. Needless to say, the helper should be able to assume the duties of operator without further training. This he can only do if he has been properly instructed during the time he has served as a helper.

Knowledge of the why's and wherefore's of any operation not only gives the individual more confidence in his work, but enables him to judge his results, either good or bad, and if bad, he immediately knows it and takes corrective measures. This is especially applicable in the operation of water filtration plants which are furnishing water to meet the high standards of purity required at this time.

Attitude of Operators a Reflection of the Supervision

The attitude of the operators and helpers in a plant hinges entirely on the type of supervision. In one plant the employees show unusual interest in their work, keeping close watch of all operations and detecting any part of the operation or equipment which apparently is not giving the desired results. In other plants there is a lack of interest and this is reflected in the appearance of the plant and equipment. Both types of operation have a direct influence on the cost of producing the water. In the first instance, everything is watched closely, chemical dosages are correct, and the mechanical equipment is kept in good operating condition and not allowed to deteriorate. In the second instance, dosages vary and chemicals are wasted, and usually the mechanical equipment is not kept in good repair. It might be said, it just operates and that is all.

The Author

The J. I. T. training course developed during the war has been used by the writer with excellent results. The reason for starting to use it in training operators and helpers was the lack of uniformity in training the employees. In the plants under the writer's supervision there were two large pumping stations and two filtration plants, one twelve million gallon daily capacity and the other twenty-four million gallon daily capacity. The combined daily pumping capacity was 105 million gallons. A total of 24 men was used in operating these plants, exclusive of the writer. The shifting of labor during the war is well known and quite a large number of changes had to be made immediately; that is, a helper might be classified to operator over night since under the stress of manufacturing explosives there was no let-up and the helper would have to have sufficient training to take over the operator's duties at once.

When a prospective employee was interviewed, we explained his duties and the fact that it was shift work, and pointed out the disadvantages of this type of work, as well as the extra compensation he would receive. He was also given all information regarding the hours he was expected to work, extra compensation for overtime work, insurance, safety, etc. In other words, every attempt was made to have him understand exactly the kind of job he was applying for. During the time used in explaining the job, opportunity was given him to talk about his qualifications; and, summing everything up, one had a fairly good opportunity to judge his fitness, etc.

Card System Used

As soon as the new employee reported for duty his training started. He would be assigned to an operator, but due to the type of shift schedule used he would work with two different operators, depending on the shift. During the first two days his only duties were to familiarize himself with the plant. The operator would have him accompany him on his rounds and would show him all parts of the plant, explaining in a general way the various operations, locations of valves and course of the water through the plant. The operator was then given a card covering one particular part of the plant, for example, filter washing. The card was headed "Filter W a s h i n g,—Time 2 Weeks." This indicated to the operators that during the two week interval the helper was to be taught the operation of washing filters. Each step in washing a filter was shown and numbered, starting with No. 1, which might be "close influent valve." Following each step is a brief explanation of what occurs when that particular part of the procedure is carried out.

Each part of the plant was covered by a card or cards made out as above. After all cards had been gone over with the employee and in the times specified on each, the reaction of the employee to the training was dis-

*Formerly Water Supply Engr., Volunteer Ordnance Works, Chattanooga, Tenn.

cussed with the operators, who would give their impressions of the trainees' ability. Following this, the writer would interrogate him on various parts of the plant. In the time allowed, if he had been properly instructed, he would know the answers. During this time of training he was acting as helper and was subject to instructions from the operator in charge of the shift.

By the use of the above method of training all employees received the same instructions while avoiding other methods of operating which conflicted with the standard procedure.

This method of training applies equally well to any type and size of plant regardless of labor turnover. There are bound to be vacancies from time to time and it is good business to have men properly trained and ready for advancement. There is another idea in using this method of training and that is, it can be used as a refresher course for all employees at regular intervals.

It is believed that the following benefits obtain from J. I. T. training:

1) Uniform operating results.
2) Increased interest in the job.
3) A desire to obtain additional information relative to water purification.
4) Training in a minimum time.
5) Reclassification of employees to higher grades without further training.

Seagirt's New Twin Outfall Sewer of Wrought Iron Pipe

Seagirt, N. J., has a new outfall sewer constructed from 12 in. wrought iron pipes jointed with long split W. I. sleeves of ½ in. wall thickness welded in the field. Because of the ocean conditions and stresses created by storms and shifting sands the twin line construction and heavy joints were employed in preference to a single line of larger diameter. Such practice and the use of wrought iron pipe has been favored on the Jersey coast for many years. The Seagirt outfall was fabricated by the Thomas Proctor Co. of Long Branch, N. J., from Byer's extra heavy W. I. pipe.

"Clean Waters," G.E. Film Released Nationally

"Clean Waters," the 16-mm. color film and sound motion picture produced by the General Electric Co., with the U. S. Public Health Service cooperating, is now available for showings to civic organizations and other interested groups throughout the country.

When we reported the first public trial showing of this picture at the N. J. Sew. Wks. Assn. meeting in Trenton in our April issue, we said that this picture "should do much to explain to the non-technical audience the dangers of pollution as well as to show by diagrams just how a sewage treatment plant works." We also said, "This picture vividly shows what happens to clean waters when wastes are discharged into them. Without doubt, this picture, which has had excellent technical editing from the standpoint of both photography and sanitary engineering, is an outstanding contribution to the program of clean streams."

Speaking at the Press Preview of "Clean Waters" in New York, Dr. Thomas Parran, Surgeon General of the U. S. Public Health Service, said, "The General Electric Co. is to be congratulated for producing this highly instructive picture."

Bookings of the film, which runs 27 minutes, may be made through local utility companies or any General Electric apparatus sales office. G-E not only supplies the film, but also supplies a supervisor, who puts the film on and arranges for equipment, operators and details.

Ninth Annual Short Course at Louisiana State University

The Ninth Annual Short Course for personnel employed in water and sewer departments in the State of Louisiana was held at Louisiana State University on July 25-26-27.

The School, which ended with examinations for operator certificates, was sponsored by the General Extension Division of the College of Engineering of the University in cooperation with the Louisiana State Board of Health and the Louisiana Conference on Water Supply and Sewerage.

Among the many topics discussed were: The Care and Maintenance of Pumps, Motors, and Plant Equipment; Protection of Water Quality from Plant to Consumer; First Aid; Surplus Property; Municipal Civil Service; Public Relations; Hydraulics; Compound Meters; Silicates in Water and Sewage Treatment; Maintenance; Industrial Waste Treatment; and Sewage Works Problems.

The annual meeting of the Louisiana Conference on Water and Sewage was held during the short course.

ALABAMA JOINS THE RANKS*

Inaugurates Short Course School and Organizes Water and Sewage Works Association

CULMINATING efforts started in 1937, but delayed by the war, the first Short Course and Conference for Alabama Water and Sewage Works Operators was held May 22-25, at Alabama Polytechnic Institute, Auburn, Ala.

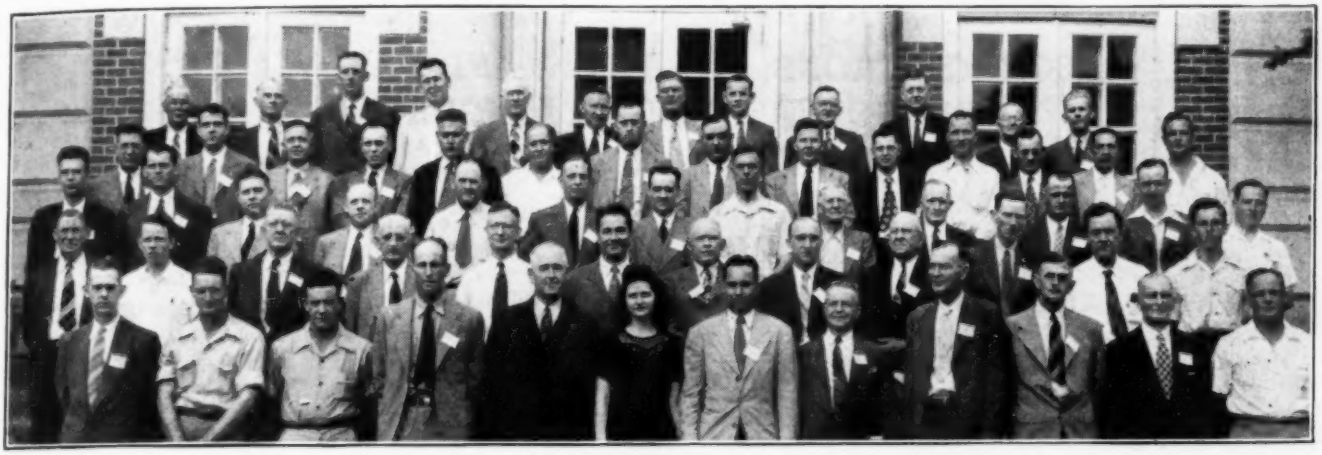
The Short Course was sponsored by the Alabama State Department of Public Health, the University of Alabama, and the Alabama Polytechnic Institute. Alex. O. Taylor, Director, Engr. Ext. Serv., Alabama Polytechnic Institute, Auburn, Ala., having been a prime mover in the organization work, acted as Co-Chairman and director of the meeting, with Prof. Gilbert H. Dunstan, Sanitary Engineering Dept., University of Alabama, Tuscaloosa, Ala.

Also active in organizing the conference were T. H. Milford, Chief Engr. and Director, Bureau of Sanitation, Alabama State Dept. of Public Health, and his assistants A. W. Beck, Head, and Charles W. White, of the Water and Sewage Section.

Attendance Gratifying

In the State of Alabama there are 297 public water supplies and 47 sewage treatment plants. While some of the larger plants have several operators, many of the smaller communities have only one operator for both water and sewage works. Considering this fact, it is estimated that there are probably no more than 325 operators in the state.

The registration at the meeting showed that of the 85 persons attending, sixty-five were operators, superintendents or managers of water or sewage works, or both. An attendance representing 20 per cent of all of the operators in the state speaks well for both the operators and the sponsors. With this start, future short schools are bound to be a success.



Business Session

At the end of the conference and short course, the managers and operators present set up the organization of the Alabama Water and Sewage Association. Temporary officers were elected and committees were appointed to draft a constitution and by-laws. Dues were fixed at two dollars a year to provide funds for organizing the second short course, to be held next year. Tentative provisions were made to provide for the new Association to affiliate with the Federation of Sewage Works Associations.

The temporary officers elected were as follows:

President

W. W. Pointer, Supt.
Water, Light and Sewage
Troy, Ala.

Vice-President

W. H. H. Putnam, Asst. Gen. Mgr., Birmingham Water Co.
Birmingham, Ala.

Secretary

Alex O. Taylor, Director
Engr. Extension Service
Alabama Polytechnic Institute

Treasurer

Prof. Gilbert H. Dunstan
Sanitary Engineering Dept.
University of Alabama

Editor of the Bulletin

A. W. Beck, Head
Water and Sewage Section
Alabama Dept. of Health

Technical Sessions

During the three and one half day technical sessions, the following program of papers and talks were presented:

The School of Engineering and Technical Short Courses and Conferences—**Dean J. E. Hannum**, Dean School of Engineering, Alabama Polytechnic Institute.

The Need for Water and Sewage Short Courses and Conferences in Alabama—**T. H. Milford**, Chief Engineer & Director, Bureau of Sanitation, Alabama State Department of Public Health.

The Georgia Water and Sewage School—**Arthur N. Beck**, Assistant Sanitary Engineer, Alabama State Department of Public Health.

Sanitary Engineering and the Short Course Schools—**Prof. Gilbert H. Dunstan**, Assoc. Prof. Sanitary Engineering, University of Alabama.

Sanitary Bacteriology—**Dr. Ben F. Cox**, DVM, Professor of Bacteriology, Alabama Polytechnic Institute.

Water Bacteriology—**Dr. H. P. Sawyer**, Director of Laboratories, Alabama State Department of Public Health.

Water Chemistry—**John Stalcup**, Chemist, Water Works, Mobile, Alabama.

Pumps and Pumping Problems—**Prof.**

*A report based on notes and information furnished by Alex. O. Taylor, Dir. Engineering Extension Service, Alabama Polytechnic Institute, Auburn, Ala.

T. M. Lowe, Head, Civil Engineering Dept., Alabama Polytechnic Institute.

Wells and Well Water Supplies—**W. W. Pointer**, Manager, Water & Lights, Troy, Alabama.

Sampling and Handling Samples—**Chas. W. White**, Assistant Sanitary Engineer, Ala. State Department of Public Health.

Filtration, Alabama Problems and Practices—**Arthur N. Beck**, Asst. San. Engr., Alabama State Department of Public Health.

Experiences with Gravity Filters—**R. W. Scott**, Service Division, West Point Mfg. Co., Langdale, Ala.

Field Trip New Opelika, Alabama Waterworks—**F. C. Basenberg**, Polglaze & Basenberg, Consulting Engrs., Birmingham, Ala.

Tastes and Odors in Water and Corrective Treatment at Decatur, Ala.—**C. W. Kurse**, Associate Sanitary Engr., T.V.A., Wilson Dam, Ala.

Aeration Activated Carbon, Ammoniation Break-Point Chlorination and After Treatment—**N. L. Dudley**, Supt. of Filtration, Water Works, Columbus, Georgia.

Experiences with Water Storage Standpipes, Tanks and Basins in Tuscaloosa—**W. H. Nicol**, Water Commissioner, Tuscaloosa, Ala.

Water Works Management—**A. O. Norris**, General Manager, The Birmingham Waterworks Co., Birmingham, Ala.

Metering, Testing, Servicing and Rates—**Frank G. Crow**, General Manager, Water Works, Florence, Ala.

Industrial Water Supply—**George Wall**, Engineer, Industrial Water Supply, Birmingham, Ala.

Sewage Treatment Plant Operation—**R. C. Barton**, Chemist, Jefferson County, Birmingham, Ala.

Stream Pollution—**Prof. Gilbert H. Dunstan**, Assoc. Prof. San. Eng., University of Alabama, Tuscaloosa, Ala.

In addition to the above, two motion pictures were shown through the courtesy of the Cast Iron Pipe Research Assn.

In succeeding Short Courses and Conferences in Alabama, it is planned to divide the operation into groupings A, B, and C and future programs will be planned to provide half or more of the features as specific interest to the different class groups, while the remaining items on the program will be subjects of interest to all persons attending.

LABOR RELATIONS, INFLATION, AND FAIR WAGES IN THE WATER SUPPLY INDUSTRY

To Be Featured on the Penna. Water Works Ass'n's 50th Anniversary Meeting in Atlantic City

October 15th-18th will see the Pennsylvania Water Works Association holding its Golden Anniversary Meeting at Hotel Traymore in Atlantic City.

President John H. Murdoch, Jr., has just released what has the appearance of the most interesting program in the history of the venerable and productive Pennsylvania association.

Some of the highlights of this program are the following:

October 16th (Morning)

An address on "The Free Enterprise System" and its meaning to America, by H. G. Moulton, President of the Brookings Institute.

"The Economic Effects of Labor Saving" with especial emphasis on the effects on the water supply industry, by Solomon Fabricant, Nat'l. Bureau of Economic Research.

October 16th (Afternoon)

A discussion of improvements in design, construction and operation of water plants and offices, with especial emphasis on improvements which have resulted or will result in better service and operation in labor saving. This portion of the program is being arranged by the Water and Sewage Works Mfrs. Assn. The theme of this session is "A Half Century of Progress" during the lifetime of the Association, with emphasis on current advances and things to come.

I. M. Glace, Consulting Engr., will lead off with "Fifty Years of Progress in Water Purification." Speaker to be named by the Manufacturers' Assn. will then relate "Progress in Pumping, Distribution, Office Management," and the session will then hear a discussion by the Committee on Economics of Operations, followed by free discussion.

October 17th (Morning)

"Operation of the Office of a Small Water Company" is the opening topic discussed by C. M. Hartman of Water Utilities Service Corp.

Following this, the Committee on New Classification of Accounts and Continuing Property Records will report, after which its members will sit as a panel during an open question and answer period.

October 17th (Afternoon)

"Water Works and Labor Laws," by Fredrick H. Knight and Norman Dutton, Attorneys at Law, promises to be a well attended discussion, as does "Fair Wages" by Dr. George Taylor, Prof. of Industry, Univ. of Pennsylvania, who will attempt to answer such questions as "How can water works operators know what fair wages are? Can objective standards be found? Is there any method of avoiding employer-employee clashes and strikes, or governmental regulation?"

"What Do Employers and Employees Want?" is the question to be discussed by Dr. E. Wight Bakke of Yale University's Labor and Management Center, in which the all important question is: Can management of water utilities bring about successful operation and labor good will and peace?

Discussion of these important papers will be opened by the Committee on Labor Relations.

October 18th (Forenoon)

"Water Works and Inflation" is to be discussed by Allen Temple, Vice Pres. and Economist, Nat'l. City Bank, who will bring out the nature and causes of inflation—its effects on such regulated industries as water works—what role should small businesses, such as water works, play in seeking to avoid inflation and its effects?

At the close of the meeting at noon a "Summary Review" of the entire program will be made by Joseph A. Beck, who will summarize what has been heard; where do water works operators stand—what should they do?

Another interesting feature of the program will be the special after session "clinics" scheduled by the Committees on Labor Relations and Economics of Operation on the 16th and 17th, to which those in attendance can bring their problems and questions in informal conference. Likewise "clinics" on the 17th are to be held by the Accounting Committees.

A decidedly new feature of the meeting of the Penna. Water Works Assn. is the entertainment scheduled for the 17th by courtesy of the Water and Sewage Works Mfrs. Assn.—the "Club Room" idea.

CENTRAL STATES SEW. WKS. ASSN.

Holds 18th Annual Meeting at Purdue

AS of June first this year, the Central States Sewage Works Association was the world's largest, just as it was at the same time last year. This fact became evident during the business meeting of the association held during the 18th Annual Meeting at Purdue University, June 13-14.

Presidents

Incoming — *E. J. Beatty, State Bd. Health, Madison, Wis.*

Outgoing — *Dr. W. D. Hatfield, Supt. San. Dist., Decatur, Ill.*

Business Session

Inasmuch as there was no meeting last year, the officers had held over for two terms, but for the ensuing year the following officers were elected:

President
E. J. Beatty,
State Dept. of Health
Madison, Wis.

First Vice President
P. W. Riedesel,
State Dept. of Health
Minneapolis, Minn.

Second Vice Pres.
C. B. Carpenter, Supt.
San. District of Hammond
Hammond, Ind.

Third Vice President
L. S. Kraus, Chief Chemist
Peoria Sanitary Dist.
Peoria, Ill.

Secretary-Treasurer
John C. Mackin, Chemist
Nine Springs Sew. Tr. Plant
Madison, Wis.

Federation Director
C. C. Larson, Ch. Chem.
Springfield San. Dist.
Springfield, Ill.

Vice Presidents

First — *P. W. Riedesel, State Bd. Health, Minneapolis, Minn.*

Second — *C. B. Carpenter, Supt. San. Dist., Hammond, Ind.*

According to the report of Sec'y-Treas. Mackin, the membership numbered 555, with 219 from Illinois, 111 from Wisconsin, 103 from Indiana, 54 from Minnesota, and 58 others. During the meeting several new members joined the association, and several others paid up back dues, thereby bringing the total membership even higher than the reported figure.

It was voted by the assembled members to continue the publication of the *Windmill*, the news letter of the association.

Awards

At the annual banquet held in the auditorium of the Purdue Memorial Building, where all the sessions were held, three awards were made.

George Martin, Supt. of Sewage Treatment, Green Bay, Wis., was named to receive the Kenneth Allen Award of the Federation, for his devotion and service to the association for the past several years.

Don E. Bloodgood, Prof. of Sanitary Engineering at Purdue University, was voted the Gus Radebaugh Award for the best technical paper presented during the past year, by a member of the CSSWA.

Walter M. Kunsch received the award for the best operating report submitted by a member of the association to his board of trustees or management officers in 1945.

Welcome to Purdue

Under the presiding gavel of President William D. Hatfield, Supt. Sanitary District of Decatur, Ill., the hundred and fifty or so registrants were welcomed to Purdue University by **Prof. R. B. Wiley,** Head of the School of Civil Engineering. Purdue University, with its facilities in its Memorial Union Building is an excellent place to hold a technical convention of this type and the CSSWA followed by two months a similar meeting held in the same place by the Indiana Section AWWA. Professor Wiley, an excellent host himself, typifies the spirit of Purdue University and its interest in the advance of the field of water and sewage works. That Purdue is interested in the field of sanitary engineering, including stream pollution abatement, water and sewage treatment, and industrial waste disposal, is evidenced not only in the development of the sanitary engineering department under Prof. Bloodgood, but also in industrial waste studies being carried on in that department.

Awards

Gus Radebaugh — *Don E. Bloodgood, Prof. San. Engr., Purdue Univ.*

Kenneth Allen — *Geo. W. Martin, Supt. Sew. Tr., Green Bay, Wis.*

At the present time research projects are being carried forward on the treatment of strawboard wastes, brewery wastes, metal plating wastes, and milk wastes. Studies are also being made on the anthracite filter, and three activated sludge units are available for special studies. The department also does extension work throughout the state.

Under the chairmanship of Prof. Wiley, the Stream Pollution Control Board of Indiana is progressing

More Officers

Third Vice-Pres. — *L. S. Kraus, Chemist, San. Dist., Peoria, Ill.*

Secy-Treas. — *J. C. Mackin, Chemist, San. Dist., Madison, Wis.*

Programmers

Host
R. B. Wiley
Head Civ. Engr.
Purdue Univ.

Fed. Legislation
Adm. J. K. Hoskins
Asst. Surgeon Gen.
USPHS

with its avowed purpose to clean up the Indiana streams. As yet, most of the work is being done by municipalities, but industry too is beginning to study its problems. Indiana does not classify its streams; it intends to abate all pollution as rapidly as possible and in due time standards of stream purity will become more rigid.

State Sanitary Engineers Report

The State Sanitary Engineers of the four states comprising the CSSWA reported on the status of sewage treatment in the respective states. **B. A. Poole** of Indiana, and **C. W. Klassen** of Illinois made their own reports but in the absence of L. F. Warrick of Wisconsin and H. A. Whittaker, their reports were made by **George F. Bernauer** and **Harvey G. Rogers**, respectively.

In Wisconsin, one third of the population is served by primary treatment (111 plants) and two-thirds by complete treatment (106 plants). Only fifty-two cities have no sewage treatment plants. Thirty cities use sewer rental, and it is expected that several more will, as additions and new plants are constructed.

In Indiana, 70 per cent of the urban population (1,300,000 persons) have sewage treatment. Sixty-two per cent are afforded complete treatment and 8 per cent, primary treatment. There are now sixty sewage treatment plants being planned, thirty-five of these after orders from the State Board of Health. When these sixty plants are completed, 95 per cent of the population of Indiana will have sewage treatment.

In Illinois the greatest war damage to the pollution abatement program has been the decay of old plants, according to Mr. Klassen. In 1929, 1,600,000 persons were afforded sewage treatment; today, the sewage from 5,600,000 persons is treated in 265 plants. Recent legislative enactment authorized townships of less than 5000 to buy or build sewage treatment plants, and unincorporated villages can also build plants or contract with neighboring communities for sewage treatment. Of 1198 post war planning projects, 257 are for sewers or sewage treatment, and of these 141 are for new plants or additions to old ones. Industrial waste treatment is also receiving its share of attention.

In Minnesota 209 municipalities have sewage treatment facilities, of which half are primary treatment and half complete treatment. Ninety municipalities have no sewage facilities but there are now sixty projects for sewage plants or major improvements in old plants.

Copper in Sludge Digestion

Small amounts of copper in sewage are insidious because copper tends to concentrate in sludge and to build up to toxic concentrations in sludge digestion tanks. So said **H. T. Rudgal,** Supt. of Sewage Treatment, Kenosha, Wis., who read a paper on "The Effect of Copper on the Operation of the Kenosha Plant."

Hourly Variations
W. A. Sperry
Supt. Sew. Tr.
Aurora, Ill.

Copper in Sewage
H. T. Rudgal
Supt. Sew. Tr.
Kenosha, Wis.

The Kenosha plant was started in 1940 and within a short time it was observed that sludge digestion was not taking place properly. A check of the industries in the city showed that copper bearing wastes were being introduced into the sewage by one company. When these wastes were bypassed directly to Lake Michigan gas production began. While copper was being introduced into the sewage, gas production was less than 2500 cu. ft. per day or 0.5 cu. ft. of gas per lb. of volatile matter added. When the copper wastes were removed from the sewage, gas production increased to a normal 10-11 cu. ft. per lb. of volatile matter added.

In 1943 a new copper problem developed. In January the copper concentration in the sludge was 5000 ppm. on a dry basis and gas production had dropped 27 per cent from normal. When the copper concentration reached 13,000 ppm. dry basis the gas production had dropped 64 per cent from normal.

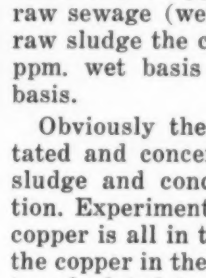
Mr. Rudgal has observed that the effect of copper on sludge digestion bears an inverse relation to the concentration of copper on the dry basis, not on the wet basis. When the digester sludge averages 2500 to 3000 ppm. copper on a dry basis or 0.25-0.30 per cent dry basis, there is little observable effect on gas production. In 1943 when the concentration was 13,000 ppm. or 1.3 per cent dry basis, gas production was only 35 per cent normal; in 1940 when the copper concentration was 50,000 ppm. or 5 per cent dry basis the gas production was only 5 per cent normal.

Only small quantities of copper present in sewage will cause these deleterious effects. For example, at Kenosha a discharge of 25 lb. per day of copper into the sewers produces only 0.7 ppm. of copper in the raw sewage (wet basis), but in the raw sludge the concentration is 220 ppm. wet basis or 3700 ppm. dry basis.

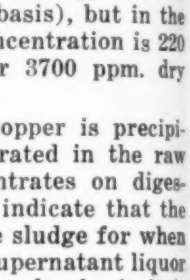
Obviously the copper is precipitated and concentrated in the raw sludge and concentrates on digestion. Experiments indicate that the copper is all in the sludge for when the copper in the supernatant liquor is calculated to the dry basis it is the same concentration as in the sludge (dry basis). Both hydrated copper sulfate and copper hydroxide are toxic.

Stream Pollution and Federal Legislation

Adm. J. K. Hoskins, Asst. Surgeon General, U.S. Public Health Service, and President of the Federation of



Activated Sludge
Dr. C. C. Ruchhoft
Prin. Chem.
USPHS
Cincinnati, O.



Public Relations
Dr. Geo. E. Symons
Assoc. Ed.
Water & Sewage Works, N.Y.C.

State Sanitary Engrs.

Illinois	Indiana
C. W. Klassen	*B. A. Poole*
Springfield	*Indianapolis*

(Wisconsin's Warrick and Minnesota's Whittaker sent substitutes, T. F. Wisniewski and H. G. Rogers)

Sewage Works Associations, reviewed the legislation that has been proposed on the matter of Federal participation of control of stream pollution.

Congress seems to think that the Federal Government should actively participate in the matter of stream pollution abatement and for the past several sessions has had before it bills that would enact such participation. Always there have been two viewpoints; one in which the attack would be completely cooperative, with the regulating authority left to the states and the other in which the Federal Government would assume almost total regulatory rules, conduct surveys, set standards, and operate the program.

During the present Congress, hearings were held before the Rivers and Harbors Committee, with proponents of both ideas presenting their respective views. The Committee concluded that both sides had good points and drafted a compromise bill, H.R. 6024 in place of the Mundt Bill, H.R. 519 and the Spence Bill, H.R. 4027.

Adm. Hoskins reviewed the seventeen provisions of the new bill briefly as follows:

1. The USPHS is named to administer the stream pollution abatement program.

2. Cooperative efforts between states, uniform legislation, and interstate compacts are encouraged.

3. Congressional consent to interstate compacts is given.

4. The USPHS is to make surveys on special problems at requests of the states.

5. Survey reports are to be made available to interested parties.

6. Grants or loans for construction of remedial measures will be made up to one-third of the cost of projects approved by state health authorities.

7. Loans are authorized.

8. An advisory board to the Surgeon General is set up; members to be drawn from USPHS, Dept. of War, Dept. of Interior, Dept. of Agriculture.

9. The Surgeon General is to review all plans for projects. The USPHS is made responsible for the administration of the law. A system of priorities is set up for projects.

10. Grants of $100,000,000 a year will be made for remedial measures.

11. The States are to receive $1,500,000 each year for study of pollution problems. $1,500,000 is provided for the yearly cost of administrating the bill.

12. Ample and augmented personnel is to be provided in the USPHS.

13. The USPHS is to classify waters, develop standards by regions, and designate wastes injurious to any forms of life.

14. The basis of authority is set up. Federal policy is declared and court action is authorized for violation of this policy.

15. Limits on these court actions are defined; such actions to be taken after state or local authorities fail to act, or six months after an abatement order has been issued.

Sanitary Engineering Profs.

Illinois	Minnesota
H. E. Babbitt	*Geo. J. Schroepfer*
Urbana, Ill.	*Minneapolis, Minn.*

16. Two years' grace is allowed after enactment of the law before these prosecutions may begin.

17. Exemptions are granted where treatment for the waste is unknown or for municipalities that can not afford to construct remedial measures. The Board's decision governs in these cases.

If this bill is not called up and acted upon before the end of the present Congress, then a new bill will have to be introduced into the next Congress.

Digested Sludge Aids Activated Sludge

L. S. Kraus, Chemist of the Greater Peoria Sanitary District, presented a case for "Digested Sludge—An Aid to the Activated Sludge Process." Noting that the volume of the sludge return is equivalent to the sludge index as long as there is no turbulence in the final tanks, Mr. Kraus observed that as the sludge index increased, the volume of waste activated sludge likewise increased while its concentration decreased. At that time primary treatment efficiency decreases and the load on the activated sludge process increases. Thus a vicious cycle results.

At Peoria the activated sludge was generally bulking. Seventy-five per cent of the time the sludge index was above 200, and 59 per cent of the time it was above 250. When it got to 350 conditions were really bad, and the primary effluent had to be bypassed. In one four month period the sludge index was above 350 for 15.4 per cent of the time, and bypassing was done 8 per cent of the time.

At that time it was thought that bulking was due to shock industrial loads. To overcome the bulking tendency, the attempt was made to increase the density of the activated sludge. This was done by mixing activated sludge with digested sludge and aerating the mixture for a period of ten hours. From this mixture a dense, low sludge index-activated sludge was produced. This heavy sludge was then mixed with the regular activated sludge in the process and the sludge volume and sludge index of the activated sludge was decreased, and bulking stopped.

It is now the practice to aerate this mixture of activated and digested sludge for 24 hours after which time this mixture is exchanged for activated sludge in the process. The system is effective, as shown by experimental data over several periods.

No additional gas is produced in the sludge digestion tanks, but the amount of waste digested sludge is decreased. One tank is required for this process and is known as the sludge treatment-aeration tank. Material added to that tank for aeration is about equal portions of digested sludge of 2 per cent solids, and activated sludge of the same relative concentration. It is the aim to add one pound of digested sludge to one pound of activated sludge. The resulting sludge has a density

Breakfast Master	Garbage Digestion
W. W. Mathews	*D. P. Backmeyer*
Supt. San. Dist.	*Supt. Sew. Tr.*
Gary, Ind.	*Marion, Ind.*

Trickling Filters

Dr. F. W. Mohlman
Director of Laboratories
Chicago San. District

C. B. Obma
Engineer
Walker Process Equip., Inc.
Aurora, Ill.

approximately average of the two sludges mixed in the tank.

The sludge index of this activated-digested aerated sludge mixture is approximately 111-102 and when it is interchanged periodically to the activated sludge aeration tanks, the sludge index of the aeration tank sludge is maintained at about 120-118. When the process is discontinued, the sludge index of the aeration tank sludge goes up to 280-300.

Mr. Kraus summed up the advantages of the process as follows: It affords a means of keeping the sludge index down, helps shock loads, adds nitrates where oxygen is needed, increases load capacity, requires no more air, eliminates the supernatant liquor problem, changes the activated sludge process from a sensitive mechanism to a rugged system, but it does require more pumping capacity for waste sludge. It also requires a plant of flexible design which can convert one segment of an activated sludge plant into a sludge treatment unit.

Hourly Variations in Sewage

During the course of fourteen months, **Walter A. Sperry,** Supt. of Sewage Treatment, Aurora, Ill. Sanitary District, made observations on the "Hourly Variations in Sewage Concentration and Flow." From all of the data collected, Mr. Sperry chose ten typical days for each day of the week; i.e., ten Sundays, ten Mondays, etc. These data were averaged to give the picture of the variation in sewage flow and concentration on each day of the week. Samples were collected at two-hourly intervals. Mr. Sperry observed that the averages for five typical days gave the same picture as for the ten typical days, thus indicating the trueness of the general picture.

From these curves which were shown, it is evident that the minimum flow occurs at 6 a.m. except on Sunday when it is at 8 a. m. The maximum flow is a plateau between noon and 4 p.m. Sunday flows run from plus 13 per cent to minus 13 per cent of the average, Monday's extremes run plus or minus 28 per cent of the average. Other days in the week, the extremes run from plus 18 to minus 15 per cent of the average flow.

The B.O.D. and suspended solids load follows the flow curves, but the B.O.D. and suspended solids maximum is an actual peak not a plateau as in the case of flow. The B.O.D. on Monday reaches a peak of 184 per cent of the average B.O.D. for the week. The rest of the week runs from 60 per cent below the average at minimum concentrations to 75 per cent above the average at maximum concentrations.

Public Relations

With the somewhat facetious title, "How Are Your Relations—Public, That Is?" **Dr. George E. Symons,** Assoc. Editor, *Water & Sewage Works,* presented several aspects of the application of public relations in sewage works.

From Kentucky

F. C. Dugan
State San. Engr.
Louisville, Ky.

M. L. Miller
Cons. Engr.
Louisville, Ky.

Briefly, public relations are the practical and continuous exemplification of cooperation between the owners (the taxpayers), management (the elected officials, the superintendent, etc.) and labor on the one hand and the customer (also the taxpayer) on the other. Good public relations must also envision pleasant and beneficial relations with representatives of equipment and supply manufacturers.

As far as the public itself is concerned, one of the most important factors in good relations is the truthful dissemination of information on the need for, method of, and results accomplished by sewage treatment.

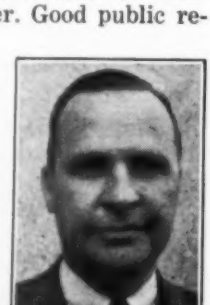
Illustrating the approach to the various groups concerned with stories of actual incidents in sewage works management, Dr. Symons said that every public relations program must have an objective. In the case of sewage works, that objective is to bring the knowledge and understanding of the policy, aims, and accomplishments to the attention of the taxpayers and the employees.

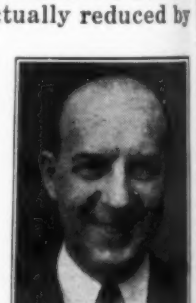
If a sewage works management desires favorable public reaction, it must be resourceful in telling its story, which must be told and retold to obtain acceptance and appreciation. "To carry out any public relations program there is no substitute for truth, research, imagination, resourcefulness, cooperation, and just plain work."

Stream Aeration

In the Flambeau River, at Park Falls, Wis., air is pumped into the stream at the rate of 41,000 cu. ft. of oxygen per day in an effort to oxidize and thereby reduce the organic oxygen demand introduced from paper mill wastes. The success of this treatment was reported on by **L. F. Warrick** and **T. F. Wisniewski** of the Wisconsin State Board of Health in their paper on "Stream Aeration."

The objective of stream aeration is to accelerate biological activity by maintenance of minimum D.O. above the critical minimum, and decrease the length of the stream engaged in biological activity. From this stream aeration 6 to 8 per cent efficiency is obtained and the B.O.D. of the stream is actually reduced by





Manufacturers' Representatives

E. F. Kinney
W. & T.
Indianapolis

Frank Lovett
Link-Belt Co.
Chicago

L. E. Langdon
P.F.T.
Chicago

R. T. Steindorf
Chain-Belt
Milwaukee

R. R. Baxter
Anderson, Indiana

*W. M. Kunsch**
Urbana-Champaign, Ill.

K. A. Mick
Minneapolis-St. Paul, Minn.

W. E. Ross
Richmond, Indiana

Superintendents All

*(*Year's best annual report)*

approximately 7600 lb. per day. To the extent that the stream recovers much more quickly than before, it can be said that the method of treatment is successful, in spite of what appears to be a relatively low efficiency.

Operators' Breakfast

With **W. W. Mathews**, Supt. of Sewage Treatment, Gary, Ind., acting as Panel Chairman, Messrs. **L. W. Kessler, Ed. Ross, Leonard Hunt** and **James Drake** answered questions presented by operators at the Operators' Breakfast.

Briefing the comments on various subjects, it appears that manual drip traps on gas lines are safer than automatic; floating covers can be kept from freezing with rock salt; the U.S. Army Manuals TM 5-665 and TM 5-666 on operation and maintenance of sewage works are valuable; planned maintenance pays dividends in sewage plants as well as water plants; metallizing of steel shafts is O.K. if stainless steel is used; sulfur in digestion tank gas varies with the rainfall; hydrogen sulfide may run from 10 to 90 grains per 100 cu. ft. without affecting gas engines (Aurora, Ill.); and apparently there is no effective paint or coating for concrete to prevent corrosion by hydrogen sulfide in digestion tanks.

Activated Sludge Studies On Pure Compounds

Dr. C. C. Ruchhoft, Principal Chemist, and **O. R. Placak**, Chemist, USPHS Laboratories, Cincinnati, reported on "The Utilization of Organic Substrates by Activated Sludge." Using sugars, starches, alcohols, oxalic acid, amino acids, peptone, gelatine, and soap, these researchers observed that the ease of removal of any compound from solution by activated sludge was a function of the individual compound rather than of the class. Removal of compounds is accomplished by absorption, assimilation, oxidation, and synthesis.

The amount of sludge produced is a function of the substrate used. Only a small percentage of the substrate removed is actually oxidized, but after 24 hours' aeration with activated sludge 90 to 99 per cent of the material will be removed from solution. Toxic substances will not oxidize. Organic acids seem to be removed better than alcohols, which are more easily removed than carbohydrates. Detailed data are available on several specific compounds, and all of this information contributes to the series of "Studies of Sewage Purifications."

Trickling Filters

In the absence of D. E. Drier, his paper on "Trickling Filters—An Evaluation" was presented by **W. B. Ooma**, Engineer, Walker Process Equipment, Inc., Aurora, Ill.

This paper discussed various aspects of the trickling filter as a sewage treatment process and included comments on loading terms, pretreatment, filter media, recirculation, high capacity filters, distribution, roughing filters, depth of filter stone, and the versatility of the unit.

Designing Grit Chambers

Messrs. H. E. Babbitt, Prof. of San. Engr., and Ming Lee, Graduate Student, University of Illinois, presented formulas for "The Design of a Grit Chamber with Constant Velocity of Flow." From these formulas is obtained a very simple method for the design of grit chambers using the Parshall flume. The method is similar to the Bushee-Howland treatment published heretofore in *Waterworks and Sewerage.*

High Rate Filters

From the National Research Council Studies and report on "High Rate Filters," **Dr. F. W. Mohlman**, Director of Laboratories, Chicago Sanitary District, summarized the results. The filters, most of which were located in army camps, were divided into groups for summarizing purposes. These groups were according to design and operation. There were single deep filters, single stage deep filters with recirculation, shallow filters with recirculation, and two stage filters.

In single stage deep filters without recirculation, the effluent ran from 14 to 49 ppm. when the loading was below 300 lb. per acre ft. per day. Above that loading the effluent was poorer and B.O.D. removals dropped below 90 per cent.

In single stage deep filters with recirculation, B.O.D. removals were greater than 90 per cent when the loading was below 2000 lb. per acre ft. per day. Higher loadings produced poorer results.

In shallow filters with recirculation rates of 50 to 1050 per cent, the loadings varied considerably, but at the higher loadings the results are poorer.

In two stage filters 85 to 90 per cent overall reductions were obtained and this reduction was fairly constant. High rate filters produce results intermediate between pri-

W. E. Howland
Prof. Civ. Engr.
Purdue University

R. S. Nelle
Engineer
State Fd. Health
Springfield, Illinois

T. F. Wisniewski
Engineer
State Fd. Health
Madison, Wisconsin

C. C. Larson
Ch. Chemist
Springfield San. Dist
(New Fed. Dir.)

Among the 200 Registrants

mary and complete treatment with either standard filters or activated sludge.

Dr. Mohlman raised two questions in his talk: Are nitrates necessary to streams, and in running B.O.D. tests on secondary effluents should the nitrate former bacteria be killed? Discussion seemed to indicate that the answers were No and Yes, respectively.

Information, Where and How to Get It

"What a Sewage Plant Operator Should Know and How to Obtain the Information" was the title of the paper presented by **George J. Schroepfer**, Prof. of Sanitary Engineering, University of Minnesota.

Inasmuch as a sewage plant operator needs to be "a combination sanitary, chemical, electrical, mechanical, hydraulic, and structural engineer," as well as "a psychologist, philosopher, biologist, bacteriologist, economist, political scientist, public speaker, writer, landscape architect" and general "jack of all trades," it is obvious that he needs to "know practically everything about everything."

Just how much of each of these subjects an operator really needs to know depends on the size and complexity of the plant he operates. Prof. Schroepfer outlined briefly some of the basic considerations to be given to what an operator should know about Sanitary Science, Biology, Chemistry, Hydraulics, Electricity, and Mechanics.

As to how to obtain the necessary information to make a well rounded operator, Prof. Schroepfer listed the following: operators' schools, conventions and technical meetings, planned reading of technical journals, visiting plants, entertaining technical visitors at one's own plant, and so forth.

As to planned reading, Professor Schroepfer suggested that it was important to differentiate between thorough coverage of a particular subject of interest and indiscriminate day-to-day reading on every subject in the literature.

Garbage Digestion

"Experiments and Development of Garbage Digestion with Sewage Solids" have been quite successful at Marion, Ind., according to David P. Backmeyer, Supt. of Sewage Treatment of that city.

The garbage is collected by the city and the sewage plant pays the city $1 per load for garbage delivered at the plant where it is ground. The ground garbage is discharged into a hopper like tank in which an air stirring system is located about two feet above the hopper bottom. The ground garbage is pumped from this zone to the digesters. In this manner, egg shells, bottle caps, glass, etc., are separated to the grit dump before the garbage enters the digestion tanks.

Entertainer Par Excellence

W. Wilbur Shaw, Pres. & Gen. Mgr., Indianapolis Motor Speedway, told his famous story of the 1931 race. The picture above shows him in his 1940 winning car.

When garbage is digested, the volume of raw sludge and the volume of digested sludge are the same. This means there is no supernatant liquor in the digestion tanks, a condition that will be improved when greater digester capacity is available.

Approximately 3 cu. ft. of gas are obtained per capita per day, and this is obtained although the garbage load per capita in Marion is approximately 0.07 lb. per day, a low figure.

Eighty per cent of the volatile matter entering the digesters is destroyed; the gas has a high carbon dioxide content. Scum in the digesters is broken up by hose and nozzle. Recirculation is continuous and prevents heavy scum build-up.

The sludge withdrawn from the digesters is sold as "liquid farm fertilizer" at a price of 15 cents per mile per 1000 gallons. The total round trip mileage is counted and the minimum charge is 45 cents. All sludge produced is sold. The digested sludge runs about 2 to 3 per cent dry solids, but this concentration will increase when more digestion capacity is available.

Entertainment

There's nothing like a college glee club for good, enjoyable entertainment. This was the consensus at the annual banquet held in the Purdue Memorial Union Building Auditorium. Especially is it good when that club was runner-up in the national glee club contest last year.

In addition to the Purdue Glee Club, the director of music presented a very attractive feminine trio and an unusually good soloist whose take-off of Ado Annie in Oklahoma was on a par with Celeste Holm, creator of the role.

As though such outstanding entertainment were not enough, the committee had arranged for **W. Wilbur Shaw**, Pres. and Gen. Mgr. of the Indianapolis Motor Speedway, to tell his classic story of "A Busy Day at Indianapolis," when he sailed over the wall in the 1931 race and lived to drive another car in that same race. It is a story that is exciting, thrilling, and humorous, and the way "Wibb" Shaw tells it makes it good entertainment at any banquet.

The evening wound up with some impromptu (?) musical competition between the engineers and chemists, led by Don Bloodgood and "Swede" Larson, respectively. In spite of the efforts of the several performers picked from the audience, the contest remained a tie, but there will be a return engagement, for this rivalry is a tradition in the Central States S. W. A.—(G. E. S.)

British Chemists Investigate Plant Growth Substances in Sewage Products

Messrs. C. A. Chaplin and C. J. Regan, of the Central Chemical Laboratory, Public Health Dept., London County Council, England, have made a detailed laboratory investigation of the amount of plant growth substances (auxins) in sewage wastes.

The results of the laboratory analyses indicated that in the case of urine, freshness of the sample is important, as the auxin content fell off to about one-sixth in three days. Fresh, raw sewage contained about 0.6 mg. of auxins per 100 grams of dried solids. Fresh digested sludge contained less than .03 mg. per hundred grams of solids. Observations made on the effect of drying indicate that over 90 per cent of the auxin content appeared to be destroyed during the drying, even air drying.

Perhaps the results of these tests give a clue as to the remarkable results obtained when wet sludge is used as a soil conditioner as compared with dry sludge.

A UNIQUE AND EFFECTIVE SEWER CLEANER

Also Useful for Removing Soft Deposits from Water Pipes

By M. W. LOVING
Consulting Engineer and
Concrete Technologist
CHICAGO, ILL.

ON MAY 3, 1946, I witnessed a demonstration of an unusual device for cleaning sewers constructed on flat grades in the financial district of New Orleans, La. The Norcan Sewer Cleaner was designed by N. M. Redmond, Superintendent of Construction and in Charge of Sewer and Water Pipe Line Maintenance of the New Orleans Sewerage and Water Board. It has been in daily use by the maintenance crews for more than eleven months and has proven its worth under practical working conditions.

In no other city of this country are maintenance problems so difficult and complex as in New Orleans. Because of unstable soil conditions and flat grades, no matter how carefully pipe lines for sewers and water are constructed, maintenance is of major importance, day in and day out.

From the accompanying pictures, taken by the writer May 3, 1946, of the maintenance crew in action in Perdido Street and under Mr. Redmond's direction, the reader can visualize and appreciate the outstanding advantages of the Norcan Sewer Cleaner. The accompanying photographs show the Norcan Cleaner before it was lowered into the manhole at Perdido and St. Charles Streets. Exactly seven and one-half minutes later it was removed from the manhole at Perdido and Carondelet Streets, having thoroughly cleaned this 8-inch lateral sewer for a distance of 325 feet in the seven and one-half minutes.

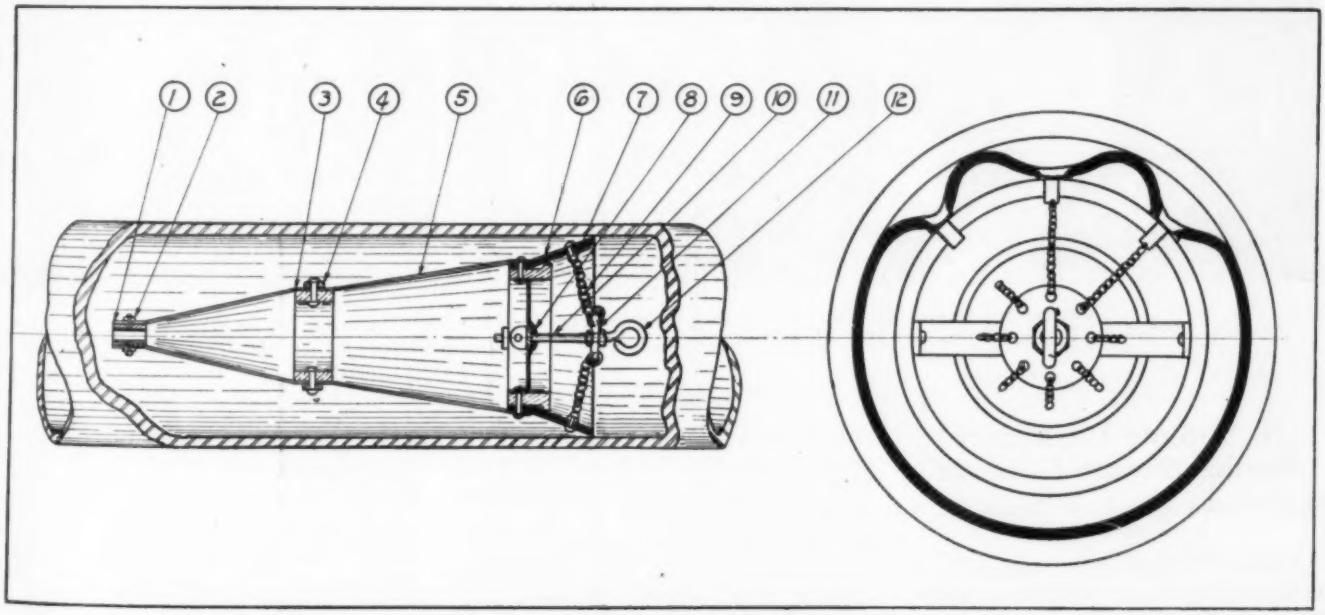
Experience has demonstrated that the head of sewage (or water) required to operate the cleaner is about 2 feet. But under normal working conditions the head ranges from 2 to 8 feet, averaging 4 feet. The tremendous scouring force created by the high velocity water, which is given a rotary motion by the device itself, removes and transports in suspension obstructions of every and all kinds. Coagulated grease, brickbats, oyster shells, false teeth, sludge, sand, grit, jewelry, etc., and money! It is said that the colored boys of the maintenance crews find a tidy sum of money in the refuse removed at the end of each operation. In two city blocks, 650 feet, the volume of refuse removed from an 8 inch lateral sewer averages about 129 buckets.

Cleaner Effects Real Savings

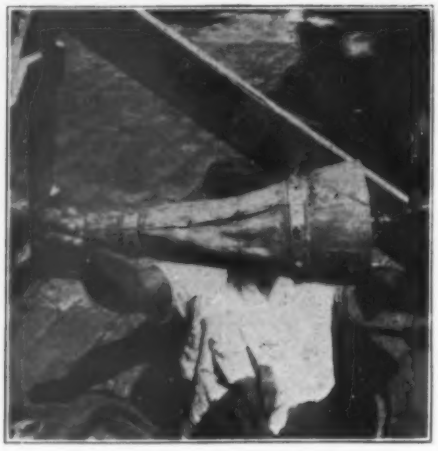
The Norcan Cleaner is designed to clean sewer and water pipe lines ranging in diameter from 4 to 48 inches. The saving effected in 2½ inch fire hose alone formerly used by the Sewerage and Water Board is from $15,000 to $17,000 per year. A two-man crew is required to operate the Norcan Cleaner, whereas five men were required for the laborious operation with fire hose and other devices. For the operation I witnessed May 3, 1946, previously mentioned, it would have taken five men more than five hours to clean the 8 inch lateral in Perdido Street, which was accomplished with the Norcan Cleaner in only seven and one-half minutes.

How It Works

During this operation when the cleaner stopped because of heavy obstructions, it was only necessary for the man shown in one of the pictures to pull the tow-rope. This action created an accelerated velocity of water at the cleaner which immediately flushed ahead the obstruction that temporarily stopped it. When the tow-rope is pulled, the openings thus created in the rubber collar, between the "pad-eyes," flushes and cleans the inner surface of the pipeline, while the high velocity water



The Norcan Sewer and Pipe Cleaner
(For Description See Text)



Side View of Cleaner for 8-in. Sewer

from the nozzle flushes all obstructions ahead of the cleaner. The tremendous force thus created is explained by the fact that the energy of water in motion varies as the cube of the velocity.

A Description of the Norcan Cleaner

To understand how the device is designed and operated, refer to the accompanying sectional drawing.

1—Brass Nozzle, which is 1½ inches in diameter for cleaning pipelines ranging in diameter from 4 to 10 inches; and 2 inches in diameter for cleaning pipe lines 12 to 48 inches in diameter.

2—Brass Clamp to fasten nozzle to canvas bag.

3—Brass Spreader Ring.

4—Brass Clamp to fasten Spreader Ring to canvas bag.

5—Canvas Bag, which is made of three-ply canvas and is 18 inches in length for cleaning pipelines 4 to 15 inches in diameter; 24 inches for 18 to 27 inch pipelines; 30 inches in length for 30 to 48 inch pipelines.

6—Rubber Collar, which is made *one-eighth inch greater in diameter than the pipeline to be cleaned.* This is of major importance to prevent excessive pull on the tow-rope. One or two men pay out the tow-rope for small pipelines, but a winch, mounted on a truck, is required for flushing the larger pipelines.

7—Brass Pad-Eyes, which are riveted to the rubber collar.

8—Brass Stop in Master Ring, which prevents Pad-Eyes from pulling out of rubber collar.

9—Stainless Steel Chains, which attach Pad-Eyes to Brass Spider. Six Pad-Eyes and Chains are required for Norcan Cleaners for pipelines from 4 to 8 inches in diameter; 8 for 10 to 15 inch; 12 for 18 to 24 inch; 16 for 27 to 36 inch; and 18 for 42 to 48 inch pipe lines.

10—Brass Master Ring.

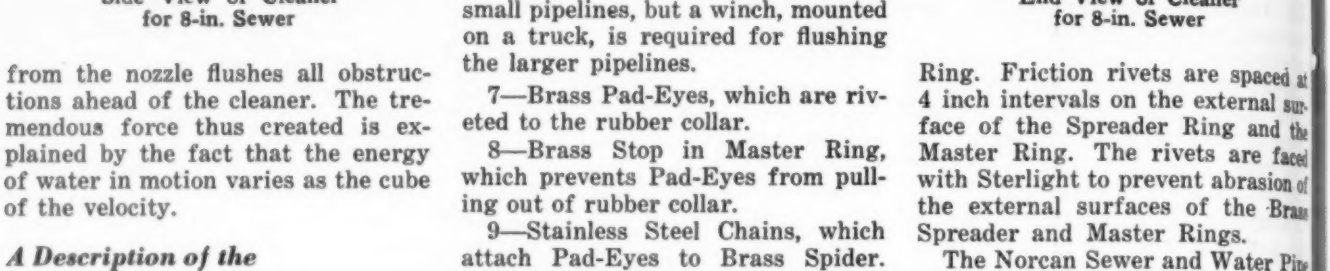
11—Brass Spider.

12—Pulling Eye, which is attached by a rod that extends through the Spider to the Stop in the Master Ring. Friction rivets are spaced at 4 inch intervals on the external surface of the Spreader Ring and the Master Ring. The rivets are faced with Sterlight to prevent abrasion of the external surfaces of the Brass Spreader and Master Rings.

End View of Cleaner for 8-in. Sewer

The Norcan Sewer and Water Pipe Line Cleaner is fully covered by patents owned and controlled by N. M. Redmond, 5920 Laurel Street, New Orleans, La.

This article has been shown to and approved by the inventor. The writer is not interested, financially or otherwise, in the Norcan Sewer and Water Pipe Line Cleaner and merely believes it should be of interest to cities throughout this country.



Pictures Made During Cleaning of 8-in. Sewer May 3, 1946—325 ft. in 7½ Minutes
(*Center picture shows method of pulling cleaner rope to release stopped cleaner by flushing.*)

N. Y. State Legislature Studies Stream Pollution

Morris Cohn Appointed Consultant to Committee

Under a legislative mandate, a subcommittee, on pollution abatement, of the Joint Legislative Committee on Interstate Cooperation will make a thorough survey of the pollution existing in New York State Waters, with a view to corrective recommendations. The personnel of the sub-committee includes legislators, state officials, and representatives of municipalities, industry and conservation organizations.

Morris M. Cohn, Sanitary and Testing Engineer for the city of Schenectady, and Editor of *Sewage Works Engineering* has been engaged as consultant to the subcommittee on pollution abatement according to an announcement by Assemblyman Harold C. Ostertag, Chairman of the Interstate Committee.

8 YEAR PERFORMANCE RECORD OF THE PLAINFIELD SLUDGE DRIER

By JOHN R. DOWNES
Superintendent
JOINT SEWAGE TREATMENT WORKS
PLAINFIELD, N. J.

THE spray drier installed at the Plainfield, N. J., Sewage Treatment Plant has recently completed its eighth year of successful day by day operation. This period has given us an accumulation of data that should be of interest to all concerned with the treatment and disposal of solids from sewage and industrial wastes.

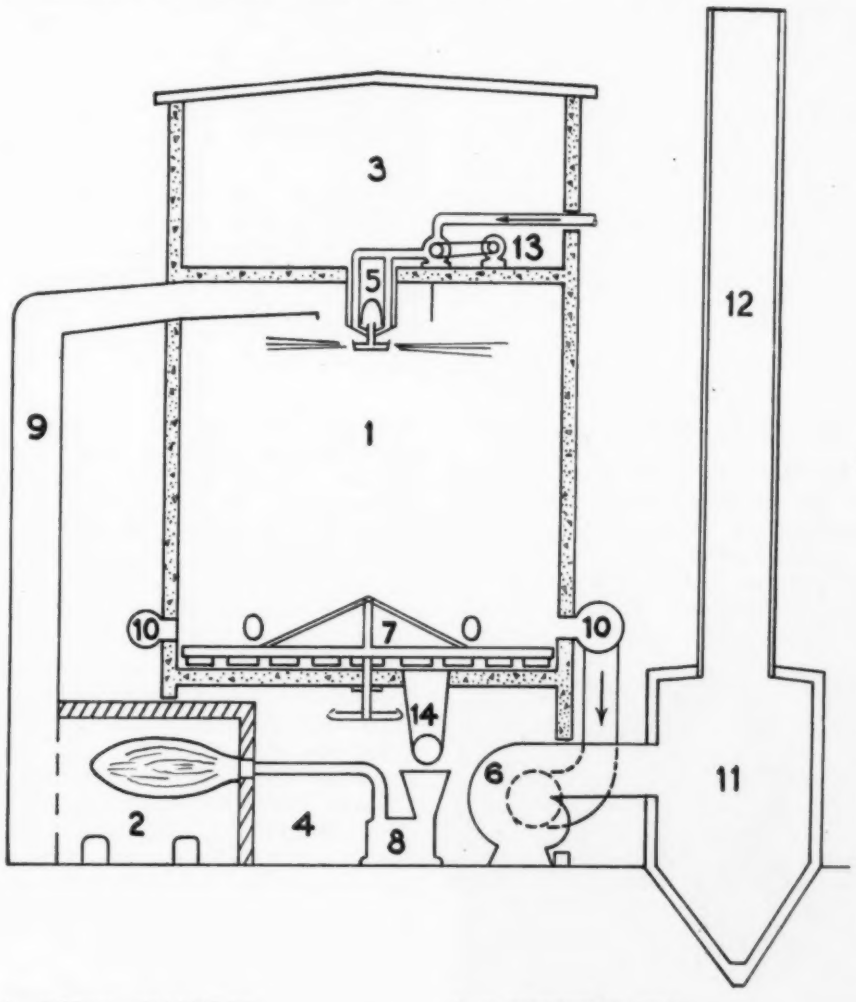
Spray drying of sludge is based on the rapidity with which water evaporates when exposed in the form of small droplets to heated air in motion, and the even greater rapidity of evaporation when the pressure within the atomizing chamber is slightly below atmospheric.

The Drier

Briefly, the construction and operation of the spray sludge drier is based on the above natural laws. We generate heat in a furnace, pick up the heat in a large volume of air moving to and through a cylindrical drying chamber, at the top center of which the sludge is sprayed in the form of a fine mist into the current of hot air (see sketch). The sludge instantly gives up its moisture to the air, simultaneously cooling the latter to a predetermined point, approximately the temperature of boiling water. The dried solids fall to the floor of the drying chamber while the vapor and exhaust gases, including the gases of combustion from the furnace, are blown to the chimney by the circulating fan. The pulverant dried sludge can be burned in suspension in the furnace or bagged for sale as humus or fertilizer base. The physical condition of the dried sludge is ideal for use without further treatment of any kind, thus completing the whole drying operation to the point of final disposal in a single operation.

It has been demonstrated that it is perfectly feasible to introduce reinforcing chemicals into the sludge just before it reaches the atomizer, or at the periphery of the drying chamber floor. This method would retain the single operation figure even if it should be decided to go in for high grade commercial fertilizer production.

While the temperature of the inlet air to the drying chamber may be as high as 900° F., this does not mean that the sludge ever reaches anywhere near that temperature. The air temperature is reduced instantly on coming into contact with the atomized sludge, the heat being used in evaporating the moisture and not in raising the temperature of the solids. The total contact period between the hot air and the sludge is approximately one-half minute. During this brief time the air temperature drops from 800 or 900° to about 250°.



1- SPRAY CHAMBER
2- FURNACE
3- CONTROL ROOM
4- FIRING, OR BAGGING ROOM
5- ATOMIZER
6- FAN
7- COLLECTING RAKE
8- PULVERIZING FAN
9- HOT GAS STACK
10- EXHAUST DUCTS
11- DUST COLLECTOR
12- CHIMNEY
13- SLUDGE METERING PUMP
14- DRIED PRODUCT CHUTE

Sectional Sketch of Spray Sludge Drier.

These temperatures are not critical or specific, and their control is merely a matter of applying a variable speed drive to the sludge feed and another to the fuel feeder for the furnace. In actual practice it has been found that these controls are adjusted 2 or 3 times hourly.

Method of Operation

At Plainfield the drier is operated about 8 hours daily; the fire, started by the operator when he arrives in the morning, warms up the furnace while he installs the atomizer in the well above the drying chamber, and the drier goes into full scale operation in 15 to 20 minutes. We are able to do this because of the small amount of brickwork that is exposed to fire, and because we burn pulverized fuel in suspension.

In summarizing the operation of the unit since 1938 we find:

(1) The structure has required essentially no maintenance in 8 years.

(2) There is no building up of deposits within the circulating fan in this system. Aside from yearly inspection and lubrication the fan has required no attention whatsoever.

(3) The atomizer has proven itself to be exceptionally sturdy and reliable; actually to the extent that we have no spare unit. Bearings are changed yearly, and the spray bowls are built up monthly, as they wear from the abrasive effect of the sludge thrown from them at such high speed.

It is not economically feasible to dry sludge of less than 10% original solids content. At Plainfield the digested sludge is first concentrated to 12 to 15% solids by an alum flotation process, the sludge coming from the digesters at 5 to 6% solids. The disposal of one ton of dry solids in the form of 6% solids content sludge is illustrated as follows:

Digested Sludge (6% solids):
2,000 lbs. solids.....(6%)
31,300 lbs. liquid.....(94%)

Thickening by Alum Flotation to 15% Solids Sludge:
2,000 lbs. solids.....(15%)
11,300 lbs. liquid.....(85%)

Spray Dried to 85% Solids and 15% Moisture:
2,000 lbs. solids.....(85%)
353 lbs. moisture.....(15%)

Net Result:

33,300 lbs. wet digested sludge is reduced to 2,235 lbs. of fluffy dry powder with 15% moisture. It is to be noted that there is no waste liquid from the process, and the end product contains the ammonia salts usually wasted in the filtrate from other dewatering procedures.

The dried material may be burned in the furnace at a value of 4,000 Btu. per pound, with a production of approximately 1,000 lbs. inert ash per ton, complete combustion being attained in the furnace.

Operating Costs

To dispose of sludge equivalent to 1 ton of dry solids and working with a thickened sludge of 15% solids, requires 3.5 hours of drier operation. Preliminary dewatering with alum flotation requires 275 lbs. alum which costs approximately $24.00 per ton. Then, for drying, we have:

Alum	$ 3.30
Labor, 3.5 hrs. at 70c	2.45
Power, 2c per K.W.H.*	2.21
Coal, $6.00 per ton	3.84
Maintenance	.35
	$12.15

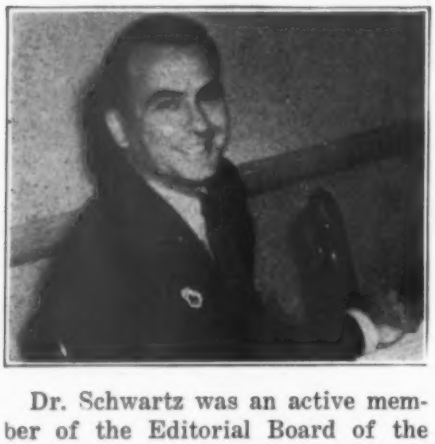
*Total load, 33.0 KW.

When the dried product is burned the cost is brought down to approximately $10.50.

Auxiliary fuel can be entirely eliminated if the original sludge solids are concentrated to approximately 25%. Since the weight of water in 25% solids sludge is only 53% as great as that in 15% solids sludge the drying time would be cut proportionally with a corresponding cut in labor and power costs.

Dr. M. C. Schwartz Dies

Dr. M. C. Schwartz, Asst. Director of the Louisiana State University Engineering Experiment Station, died this Spring, according to an announcement in the "News Bulletin" of the Experiment Station, just recently received.



Dr. Schwartz was an active member of the Editorial Board of the 9th Edition of Standard Methods for the Examination of Water and Sewage which is now nearing the printing stage. Dr. Schwartz, who was born in New Jersey and educated at New York University, was active in many technical societies, was a spark plug of the Louisiana Short Schools, and was well known for his contributions to the methods of water analysis, particularly colorimetric and photometric methods for the determination of silica, and a technic for dissolved oxygen in boiler water.

Late in 1945 Dr. Schwartz was promoted to Associate Prof. of Chemical Engineering, effective July 1, of this year. Taking over the duties of Dr. Schwartz, Mr. Louis Cusachs has been appointed Asst. Dir. of the Louisiana State Univ. Engr. Expt. Sta. and Asst. Prof. in charge of Water Technology.

Alien Patents Still Available

Patents seized from German and Japanese nationals are still available. Libraries of these patents are maintained at the offices of the Alien Property Custodian in Washington, D. C., in New York City, and in San Francisco, and also in the patent departments of the Chicago and Boston Public Libraries.

Abstracts of the patents seized by the APC are also available from the Office of the Alien Property Custodian, National Press Bldg., Washington 25, D. C. Included are 8,000 chemical patents and 37,000 mechanical and electrical patents. The cost is $25 for each lot, or they may be obtained in smaller groups of related patents.

Lieutenant Hudson Joins Freese & Nichols Engrs.

Lt. William Otis Hudson, formerly of New Orleans, is now associated with Freese & Nichols, Consulting Engineers, of Fort Worth, Texas, and will specialize in water and sewage works.

Mr. Hudson received his civil engineering education at Tulane University. He was commissioned in the Navy in June, 1941, serving as Engineering Officer in the submarine service in the Pacific.

He saw action in many places, including Australia and the Kurile Islands, and was awarded the Bronze Star for meritorious service in combat.

19TH SPRING MEETING OF NYSSWA AT UTICA

ALTHOUGH the railroad strike cut sharply into the attendance at the 19th Spring Meeting of the NYSSWA, held at Utica,

Officers

President
Uhl T. Mann
Supt. Ley Creek Sew. Treat. Plant
Syracuse

Secretary
*A. F. Dappert**
Prin. San. Engr.
Dept. of Health
Albany

**Replaces the late A. S. Bedell.*

N. Y., on May 24 and 25, not one of the scheduled program participants failed to arrive for that reason.

The effect of the strike was evident, however, in the decrease in attendance from meal to meal. Expecting more than a hundred, the committee was satisfied to see 75 at the luncheon on the first day, but by nightfall and dinner, only 52 were present, and by the time of the Sunrise Breakfast on Saturday morning there were but thirty stalwarts left, all of whom had some provision for getting back home.

Business Session

At the regular business session of the meeting, President **Uhl T. Mann** announced the actions of the Executive Committee on the previous night and obtained approval thereof. A committee of three was appointed to set up the conditions for and determine a suitable award to honor the late Arthur S. Bedell, longtime Secretary, to be given annually to some member of the Association. The committee will report at the annual meeting in January.

To fill the position of secretary of the association in place of Mr. Bedell, the Executive Committee appointed **Anselmo F. Dappert,** Principal Sanitary Engr. of the N. Y. State Dept. of Health.

The Executive Committee also adopted the report of the special committee appointed last January to study the Award for the Best Operator's Report and determine the relation of that award to the William D. Hatfield Award of the Federation. Under the present system of awards, the reports scored under the N. Y. system do not meet the scoring system of the Federation. The committee report was adopted and is to be transmitted to the Federation with the suggestion of means by which the two awards and the system of scoring can be brought more into harmony with one another.

Awards

For the best operating report for 1945, the rating committee chose the report of William Edwards, Se-

Operators' Awards

Wm. S. Edwards
Sr. Operator
Gowanda State Hospital

E. J. Smith
Supt. Sew. Tr.
Niagara Falls

nior Operator, of the Gowanda State Hospital. This was the fifth time Mr. Edwards had submitted a report, each time finishing in a better position. In accepting the award, Mr. Edwards said he regretted that Dr. Gray, the Superintendent of the Hospital, had passed on on Easter Sunday. Dr. Gray had been an enthusiastic backer of the work of the sewage treatment plant and had urged Mr. Edwards to continue to submit reports.

N. Y. State Sew. Wks. Assn. also awards a certificate for the best report submitted by a previous winner of the best annual report award. For the second time this award went to E. J. Smith, Supt. of Sewage Treatment, Niagara Falls, N. Y., whose report this year was the only entry in the class. That Smith's report was a worthy winner was evidenced by the fact that the Rating Committee chose it to be submitted from the N. Y. State Assn. in the Federation competition for the William D. Hatfield Award.

The number of gadgets submitted in this meeting's competition was below the minimum number required and no award was made, but **John Slough**, operator at Wellsville, was voted first place for his automatic bypass to remove grit from the plant influent line.

Eulogy to Arthur S. Bedell

Under the title, "I Knew Arthur Bedell," **Morris M. Cohn,** Sanitary Engineer, Schenectady, N. Y., and Editor, *Sewage Works Engineering*, read a eulogy to the late Arthur S. Bedell, first and only secretary of the New York State Sewage Works Association, until his death but a few months ago. Mr. Cohn said of Art Bedell, "He walked in simple dignity with a sincere humility. He saw both sides of a question, was scientifically honest and held no exalted opinion of himself; characteristics that stamp a man as entitled to honor and renown." Bedell's helpful spirit had built the N. Y. State Association to its high place, and while presidents came and went, it was Art Bedell's steady hand that held the organization on an even keel.

Mr. Cohn proposed that the Association create an Arthur S. Bedell award to be given annually to the person doing the most to elevate the profession, saying, "The passing of a pioneer places added responsibility for those of us who follow. We can learn from his life. We will attain dignity for ourselves and our profession if we walk as he walked."

Beet Cannery Wastes

Unless you have had the seasonal problem of beet cannery wastes in

Asst. Secy.-Treas.

J. C. Brigham
State Dept. Health
Albany

A. W. Eustance
Cons. Engr.
Middletown

(Carried on for "Art" Bedell)

your sewage treatment plant, you haven't had any problems, according to **Elvey A. Marshall**, Operator, Sewage Treatment Plant, Geneva,

Gadgeteers

R. W. Simpson
San. Engr.
Gilbert Assoc.
Reading, Pa.

John D. Slough
Supt. Sew. Treat.
Wellsville

N. Y. When the canning season is on, everything goes up—flow, suspended solids, B.O.D., grit, gas production, chlorine demand; everything goes up except, that is, pH and per cent removals, which definitely go down. The following tabulation gives some idea of the conditions that prevail.

Item	Normal	With Canning Waste
Susp. solids raw	235 ppm.	360 ppm.
Susp. sol. effl.	42	82
Susp. sol. removal	82%	77%
B.O.D.—raw	265	575
B.O.D.—effl.	110	230
B.O.D.—removal	62.5%	60%
Set. sol. ml/L. raw	12	28
Gas cu. ft./cap.	0.9	1.6
Chlor. dem.—raw	5.5	20.8

More gas is needed to maintain the temperature of the digesters because as the pH of the sewage goes down, the methane content of the gas goes down. The volatile matter in the primary sludge decreases about 25 per cent because of the added grit from the canning waste.

Mr. Marshall said that the bathing season ends before the canning season begins so that the lack of a chlorine residual in the effluent in the canning season is not so important as it is during the summer months. The city sewage treatment plant can treat the canning wastes, but it would help materially if the industry would put in operation some partial treatment. Removal of the grit from the washing operations would be a distinct help.

Wm. A. Ryan, Consulting Industrial Waste Chemist, Rochester, had prepared a discussion of Mr. Marshall's paper, and though unable to be present, had it presented for him by **Glenn Searles** of Rochester. Mr. Ryan's discussion pointed out that whereas the Geneva domestic waste was equivalent to only 20,300 persons, the industrial waste at Geneva was equivalent to 23,800 persons. Therefore, it is obvious that not only is a good plant needed but also a good operator.

Mr. Ryan classed canning wastes as underground vegetables, above ground vegetables, and fruits. Different treatments are needed for the different classes of wastes. New York State is now third in vegetables packed with more than 100 plants, 95 per cent of which are in the Lake Erie, Lake Ontario and Finger Lakes districts. Packing and canning is becoming a year round industry and this fact should reduce, to some extent, the problems of sewage treatment plants handling such wastes.

Ingenuity—Operator's Tool

With the intriguing title, "Ingenuity—Tool of the Operator," **Roland W. Simpson,** Sanitary Engineer, Gilbert Associates, Inc., Reading, Pa., presented a number of innovations, gadgets, kinks, and modifications of equipment which had been performed under his direction at Keesler Field Sewage Treatment Plant in Mississippi. During the war, Mr. Simpson was Sanitary Engineer in charge of the utilities at Keesler Field, Biloxi, Miss., for the Army Air Forces.

Program Chairman
John W. Johnson
Supt. Sew. Treat.
Buffalo

Luncheon Speaker
B. D. Tallamy
Dep. Supt.
Dept. Pub. Wks.
New York State

Among the gadgets which Mr. Simpson and his operators had developed were special sampling cans, quick opening valves for use on a tank truck spreading liquid sludge for soil conditioning, and a proportioning slotted gate for distributing flow to different channels. Improvements in equipment included a scalloped spreader attached to a rotary arm distributor on a trickling filter to give more even distribution, inserting a special nozzle near the center of the rotary arm to give distribution over the rock at the center of the filter and eliminate fly growth at that point, and insertion of special drawoff valves in the sludge digesters to permit filling of the tank trucks.

Other ingenious devices and ideas put to use to improve operation were a water spray system to keep the surfaces of the clarifiers free from scum and improve operation of the scum removal system, installation of crosses in place of tees to make it easier to clean grit chamber drawoffs, the installation of a float system and signal to warn when the digesters were full during pumping of raw sludge, and the elimination of air binding of a sewage line by devising an air trap. Truly one's ingenuity becomes one of the best tools an operator can have.

The New York State Throughway

The post war program of the State of New York was the topic of the luncheon speaker, Bertram D. Tallamy, Dep. Supt., N. Y. State Dept. of Public Works, Albany. During the past 15 years the public works program of the state of New York has deteriorated greatly. Based on a normal required expenditure, at least $750,000,000 had not been appropriated, thus leaving a great amount of necessary work undone. In a five year plan for post war work, the following expenditures are planned: Highways, $368 million; Throughway, $72 million; Parkways, $70 million; Grade Crossings, $60 million, and Canal and Misc., $19 million. Perhaps the item of greatest interest is the Throughway, a superhighway to run from New York City across the state to Buffalo and on to the Pennsylvania border. This is the greatest single project since the Erie Canal. It will be 486 miles long, will have an entire new right of way, and will pass through a belt 60 miles wide wherein reside 80 to 90 per cent of the population. There will be no crossings, no lights, and no restriction to vision for 1,000 feet ahead of any point. Cloverleaf entrance and egress will allow for

Canning Waste

E. A. Marshall
Supt. Sew. Treat.
Geneva

*Glenn Searles**
Supt. Sew. Tr.
Rochester

**Pinch hit for W. A. Ryan*

proper acceleration and deceleration of cars entering or leaving the Throughway. At the beginning there will be two, later three lanes

Penicillin Waste
F. W. Gilcreas
Assoc. San. Chem.
State Dept. Health
Albany

Eulogized Bedell
M. M. Cohn
San. Engineer
Schenectady

in each direction and the opposite lanes will be widely separated by a mall. Wide shoulders, properly and attractively designed bridges will be added features. The road will have no tolls; it is not a "Bridge" like the Pennsylvania Turnpike, but is expected to serve the entire state. Grades will have a 3 per cent maximum and curves will have a 2,800 ft. radius. The first section will be contracted in June and it is expected to require five years for completion.

Penicillin Wastes Inhibit Digestion

In a paper entitled "Inhibition of Sludge Digestion by Penicillin Manufacturing Wastes," F. W. Gilcreas, Asst. Director in Charge, Laboratories and Research, N. Y. State Dept. of Health, Albany, told of the unusual experience at the Ley Creek Plant in Syracuse. In 1945 gas production in the digestion tanks suddenly dropped to zero while the activated sludge process continued without any apparent difficulty. Obviously something was affecting the biological activity in the digestion tanks while not affecting the activated sludge floc.

Inasmuch as the penicillin manufacturing wastes which had been admitted to the sewers a short time previously had not been expected to cause any difficulty, there was some question as to where to start to look for the difficulty, but that waste being the last one admitted to the sewage plant, it was decided to investigate it first.

It was known that amyl acetate was present in the waste but the concentration was too small to affect the bacterial population of the digesters. Examination of the sludge for heavy metals indicated 50 ppm. of copper, 10 ppm. of silver, 75 ppm. of chromium, all of which were present in too low a concentration to have any bacteriostatic effect.

After further study it was found that there was no penicillin in the wastes, that the mold mat resulting from the centrifuging only added to the organic load on the plant, but that the waste from the centrifuge process would kill digestion only when present to the extent of 12½ per cent.

Then it was discovered that the vats are treated with formaldehyde at intervals, and this is then washed to the sewers. When formaldehyde is present in the sludge to the extent of 25 ppm., it will delay sludge digestion, and 100 ppm. will stop digestion altogether. While formaldehyde in low concentrations will be digested, these slugs were the cause of cessation of activity in the digesters. After a period of standing, the digesters could be reseeded and digestion would proceed.

Programmer
H. O. Johnson
Supt. Sew. Treat.
Great Neck, L. I.

Vice President
A. G. Marvin
Supt. Pub. Wks.
Tn. Tonawanda

Transmission of Disease By Sewage

In the absence of **Robert N. Clark**, his paper on the "Transmission of Disease by Sewage" was read by infectious source, second, a transmission channel, and third, a susceptible individual. Sewers must be considered a direct continuation of the diseased intestine.

As factors in the transmission of disease, Mr. Clark named, first, an Ed. LaValley, Dist. Engr., N. Y. State Health Dept. Mr. Clark's paper reviewed the history of the classic cases of disease transmission by sewage.

Among the many varieties of intestinal, water borne diseases, Mr. Clark's paper listed the following: typhoid, para-typhoid, dysentery, cholera, diarrhea, fluke infection, etc. Other water borne diseases include schistosomiasis, infectious hepatitis, and possibly poliomyelitis.

Small Plant Operation

Speaking for the many small plant (less than 1 mgd.) operators, **H. O. Johnson**, Supt., Belgrave Sewer District, Long Island, pointed out many items that designing engineers should, but often fail to consider. These include such items as sufficient hose connections, ample sampling lines, places to sample, adequate provision of tools, safety precautions throughout the plant, and accessibility to valves.

Although camouflaged buildings are attractive, small plants should not be made into parks unless there is a park department to care for the grounds. As it is, small plant operators have to be a combination engineer, gardener, bookkeeper, chemist, biologist, plumber, fireman and general handy man. To run a park and do odd jobs for the mayor, too, is a little too much to ask.

Some of the problems of the small plant operator are not experienced in the larger plants. The necessity to collect samples only during a six hour period follows because of lack of help. Few farmers come to the plant to haul away the sludge, budgets carefully worked out are often slashed out of reason by a council that neither knows nor often cares what happens at a sewage plant. Whatever else may happen and despite the lack of time to adequately do the laboratory work, Mr. Johnson does not believe that "fudging" the laboratory results is an answer to any of the problems.

Chlorine

Wilmer H. Koch, Works Chemist, Niagara Operations, Mathieson Alkali Works, Inc., talked on "Chlorine," its properties, its characteristics, its production, its handling, and its need of safety precautions.

Chlorine is produced by electrolyzing a solution of sodium chloride; the chlorine gas evolved in the process is dried with sulfuric acid,

Clean Waters Movie
H. V. Crawford
Appl. Engr.
Gen. Elec. Co.
Schenectady

Round Table Leader
Dr. Geo. E. Symons
Assoc. Editor
Water & Sewage Works

then compressed to a liquid, and "bottled" in cylinders, ton containers, or tank cars. Cylinders are carefully cleaned before each use and the valve replaced.

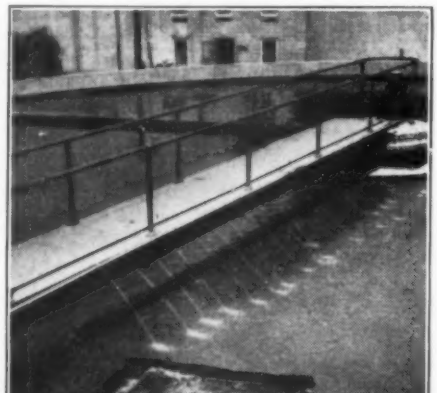
In the handling of chlorine cylinders, there are certain do's and don'ts. In the winter time store the cylinders inside; never bring the temperature of a water bath on cylinders to a boil; don't allow the cylinders to stand with the caps off.

There are certain minor repairs that can be made by the operator. If the packing in the valve stem leaks, close the valve, take off the packing nut gland, and replace the packing. If the outlet leaks, put the cap on or run the chlorine into a lime solution, or set the cylinder outside and let it leak.

To prevent chlorine hydrate in the chlorinators, keep the water supply warm. Be sure that the water supply does not suck back into the chlorinator and chlorine tanks.

Chlorine is a noxious gas and a lung irritant, but there is no excuse for anyone being adversely affected by it. Anyone can smell the gas, and if it can be smelled, proper steps should be taken. If the smell of chlorine is enough to irritate you, "Get out," and don't go back without a gas mask. When you can see chlorine, it is too strong to fool with. The main thing is to get out of the gas and avoid panics.

Mr. Koch described the effects of chlorine on the human body, how it affects the nasal passages and the lungs, and how it causes symptoms of pneumonia. The treatment is the same as for pneumonia; the patient needs complete rest. Mild doses are more irritating than painful or harmful. Treatment for such doses is largely psychological. If any treatment seems to give relief, that is the treatment to use. Sudden death from chlorine only occurs from choking in high concentrations, a condition very unlikely to prevail in a water or sewage plant. There are no after effects from chlorine on the human body.



Scum Removal on Clarifiers

System of sprays designed by R. W. Simpson, Keeseer Field, for keeping scum off clarifiers and aiding in scum removal—an ingenious kink.

One caution: Gas masks have limitations; once a canister has been used, throw it away and provide an unopened canister for the next time the mask may be needed.

Sunrise Breakfast—Question Box

A tradition of long standing in the N. Y. State Sew. Wks. Assn., the Sunrise Breakfast, with its "Questions and Answers on Operating Problems," was held for the 30 faithfuls who had transportation and worried not about the railroad strike. The session was presided over by **Dr. George E. Symons**, Assoc. Editor of *Water & Sewage Works*, and immediate past president of the Association.

The session was completely impromptu, with individual operators being asked to present a question on operation problems, and answers to the questions being sought from other operators, from engineers, and from equipment manufacturers' representatives.

Among the several topics discussed were the cleaning of porous plates, the handling of scum in digesters, variations in gas production, psychoda fly control, sludge dewatering, and chlorine demand of sewage. (G. E. S.)

Prof. Steel Leaves Texas A. & M. to Become Consultant to Venezuelan Gov't

S. R. Wright Heads Civil Engr. School

Prof. E. W. Steel, author of books on sanitary engineering and rural sanitation and Head of the Municipal and Sanitary Engineering Department of the Agricultural and Mechanical College of Texas, has resigned that position to act as consulting engineer to the Venezuelan government. In Venezuela, Prof. Steel will be concerned with the sanitary engineering problems in that country. His successor has not been appointed as yet, but Prof. S. R. Wright has been acting as Head of the Mun. and San. Engr. Dept. for the past four years.

On July 1, Dr. Wright was advanced to the position of Head of the Civil Engineering Department. Dr. Wright holds a rather unique distinction at Texas A. & M., in that he is the only man to hold four degrees from that university—namely, B.S. ('22), M.S. ('28), C.E. ('31), and Ph.D. ('46).

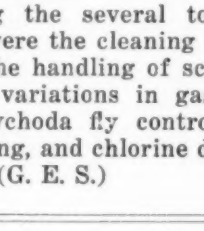
Mast and Williams Form Consulting Firm

James E. Mast, Consulting Engineer of Reading, Pa., and William D. Williams, Sanitary Engineer of Philadelphia, Pa., have announced the formation of the firm, Mast and Williams, Consulting Engineers, at 524 Court Street, Reading, Pa.

The new firm will offer professional services in water supply, sewage disposal, industrial waste treatment, flood control, as well as highways, city planning, airports, and management.

J. G. Miller Joins Gilbert Associates

Former Lt. Cmdr. John G. Miller, U.S.N.R., is a recent addition to the staff of Gilbert Associates, Engineers and Consultants, Reading, Pa. A graduate of Purdue, Mr. Miller has an M.S. degree, has served four years in the Bureau of Ships, and was employed before that for six years by the Detroit Edison Co. Mr. Miller will serve as a mechanical engineer with the company in Reading.



HOW TO USE DDT FOR INSECT CONTROL

Including a Recommendation Covering Its Application for Filter Fly Control

By

L. F. WARRICK and G. F. BERNAUER

Chief State Sanitary Engineer — Sr. Asst. State Sanitary Engr.

WISCONSIN STATE BOARD OF HEALTH
MADISON, WIS.

OUT of World War II came DDT, which proved to be the best allround insecticide ever developed to control insects which bring discomfort, disease and death to men at war. Now that the time has come to put it to work on the home front there is danger that the average person may expect too much of this so-called "miracle insecticide."

Our knowledge of the practical use of DDT in home and garden is still far from complete. Use of the material in this country is as recent as November, 1942, and although large amounts have been used here and overseas, it was restricted and used only for specific purposes by trained personnel under careful supervision. Results of this use indicated that for certain purposes and under certain conditions, DDT can be safely and effectively used by the average person.

One word of warning is necessary, however. DDT is not a cure all! It is not effective against all insects and is slower in action against certain insects than some of the more common insecticides already in use. It has little effect on chiggers and chicken mites and its value against certain other insects is not fully confirmed.

What Is DDT?

The technical grade chemical is a harmless-appearing, white, practically odorless powder resembling flour with lumps, since the DDT has a tendency to stick. It gets the name DDT from the first letter of each part of its chemical name, which is dichloro - diphenyl - trichloroethane. DDT does not dissolve in water and therefore cannot be mixed in pure form with water for use as a spray. It is soluble in oils such as kerosene and in certain commercial solvents, xylene being the most common.

How DDT Kills

DDT differs from previous insecticides both in its manner of killing and its lasting or residual effect. When properly applied to the ceilings, walls and screens of homes, it has been known to kill flies and mosquitoes for as long as seven months. It can be relied on to remain entirely effective for at least three months. Apparently DDT is absorbed through the insects' feet as they walk over a spray deposit or DDT residue. After a short period of exposure the affected insects become restless, drag their legs, and their movements become jerky and spasmodic. They may turn on their backs and be unable to right themselves. Finally they may develop tremors (the so-called "DDT's") and die. However, death may not take place until hours later. Mosquitoes and flies often move toward the light when first affected and may escape from the room to die elsewhere. So don't be disappointed if you fail to find numerous dead insects after you've applied DDT. The best test of DDT's effectiveness is the *absence of live* insects, not the presence of dead ones.

Remember, DDT is not a substitute for screens and other sanitary measures! Even though you kill the insects already present, new ones may enter if sanitary precautions are neglected.

L. F. Warrick

This article was originally prepared by Mr. Warrick for The Bulletin of the Wisconsin State Board of Health. Although it was written for the guidance of the public at large, rather than for the readers of *Water & Sewage Works*, we considered it both timely and of sufficient interest in general to water and sewage works men to print it with only a few deletions from the original.

To the original article has also been added a section relating "Experiences in Filter Fly Control With DDT" in Wisconsin, with some specific recommendations.

To all who are contemplating the use of DDT Mr. Warrick's article will constitute a valuable guide.

Read the Label Before You Buy

Several products containing DDT have appeared on the market and others are on the way. The important thing in purchasing DDT is to make sure you get the proper strength solution or dry mixture for the application intended. Following are the more common prepared products now available:

1. **Dusts.** A number of dry mixtures of DDT are becoming available for dusting. They contain from 5 to 10 per cent DDT diluted with some powder (carrier) such as talc or pyrophyllite. The label will tell you how much DDT is contained. For most uses a dust containing not less than 10 per cent DDT (one part of DDT in nine parts of carrier) is recommended.

2. **Oil Solution.** For use as a residual spray, solutions of DDT in highly refined, deodorized, white kerosene or in other commercial solvents are available. Most of these sprays will probably contain 5% or less DDT. *For use as a residual spray they should contain at least 5% DDT.*

3. **Emulsions.** Although DDT is not soluble in water, it readily dissolves in some organic solvents and concentrations of 25 to 40% can be obtained. These solutions can then

be diluted with water to the concentrate desired. Xylene is the solvent commonly used with DDT to create an emulsion. When purchasing DDT in emulsion, read the label to find out how much DDT it contains. Follow the directions on the label to dilute it to a 5% or more concentrated spray.

Those individuals who intend to use larger quantities of DDT regularly in the treatment of apartment houses, restaurants, dairy barns, and the like may wish to prepare their own emulsion concentrate. But in general, the average user will prefer to buy a ready-made product requiring only simple dilution with water.

If desired, such an emulsion concentrate (35% DDT) can be prepared by dissolving 3 pounds of technical grade DDT powder in 3 quarts of xylene and then adding 6 fluid ounces of an emulsifying agent. This will make about a gallon of concentrate which can be diluted with water (1 part concentrate to 6 parts water) to make about seven gallons of 5% spray. Strain the concentrate carefully before diluting with clean water to avoid clogging the sprayer.

At the time this is written the approximate cost of such an emulsion concentrate is about $2.50 per gallon. The net cost of the finished 5% DDT emulsion spray will thus be approximately 35c per gallon. One gallon of this spray will apply an effective DDT residue to about 950 square feet of surface.

4. **Suspensions.** A wettable DDT powder is also available, containing an additional chemical which permits the powder to mix readily with water, distributing small particles of DDT throughout the spray. A 5% spray can be prepared from such a wettable powder by diluting with the proper amount of water. The amount of water necessary depends on the concentration of DDT in the product, which is shown on the label. This DDT suspension can be applied to surfaces through a spray. It has no odor, presents no fire hazard and is harmless when applied to the skin of man or the coats of animals. When the water evaporates, small flecks of DDT and carrier will remain on the sprayed surface. Therefore this application is not recommended for furniture, dark colored paints, varnished floors and window glass, but it can be effectively and easily applied where such spotting is unimportant.

5. **DDT Fly Sprays.** Many manufacturers of well-known fly sprays are adding small amounts of DDT (one-half to 2½%) to their commercial sprays. However, the addition of DDT to such "quick-killing" compounds tends to confuse the purchaser in method of application. The quick killing sprays are intended to affect the respiratory system of the insect and require diffusion in the air for effectiveness, with frequent applications. DDT, however, is primarily a central nervous system poison and, when properly applied to the surface as a *residual* spray, retains its potent killing effect for months.

6. **Paints.** Whitewash paints and oil base paints containing DDT are being produced but since little is known about them, the manufacturer's directions should be followed. No recommendations as to their effectiveness can be made at this time.

7. **Straight DDT.*** A home-made oil spray can be prepared by dissolving DDT in a highly refined, deodorized, white kerosene. One cup of straight DDT powder (*not* a commercially prepared dust) thoroughly dissolved in one gallon of kerosene will make about a 5% DDT oil spray. Strain the solution before using to remove particles that might clog the nozzle. Do not use ordinary kerosene—use only white kerosene. The mist from this spray is highly combustible. (*Formerly termed "Technical Grade," but now known as 89°C setting point DDT.)

8. **Aerosols.** Aerosol "bombs" were used by the armed forces for spraying insecticide under pressure by use of a propellant. They contain 3% DDT, 2% pyrethrum, cyclohexanone as a solvent for the DDT, an activator for the pyrethrum and Freon-12, a liquid gas under pressure which provides the force for the spray. Such a bomb is a space sprayer which kills insects present at the time but affords only a brief residual effect. Aerosols are useful for freeing a small outdoor area of insects for periods of one or two hours, or possibly longer.

Use of DDT on Insects

Flies. The use of DDT as a residual spray is the most effective way of controlling houseflies. Apply a coating of 5% DDT solution or emulsion to the surface and repeat in three months. Use a small hand sprayer, an air pressure garden sprayer. a wide paint brush or a roller applicator to treat walls and ceilings. Be sure to apply the spray to the fly's favorite resting places—on the ceiling, around cracks and crevices, along edges of ceiling strips and doorways, and all other edges in the room. Electric cords or switch cords should be sprayed with DDT solution since flies cling to these and will receive a toxic dose. Soaking strips of bandage gauze, heavy string or cord, in DDT solution and hanging them up may serve the same purpose. In some places fly control can be accomplished merely by spraying these special places and not treating the whole room. In treating screen doors and windows, apply the 5% DDT solution on the wire screen with a wide brush. A felt roller can also be used.

Mosquitoes. Residual spraying for the control of anopheline mosquitoes has now become a routine procedure in the fight against malaria both in this country and in military operations overseas. In houses sprayed with 5% DDT solution, mosquitoes infected with malaria parasites will have ample opportunity to rest on a treated surface and be killed before they can spread the disease to others. Other types of mosquitoes which are simply annoying can also be controlled by residual spraying. Use the same methods of application as described for flies.

Cockroaches. A 10% DDT powder is effective against cockroaches and is less poisonous to pets and human beings than the sodium fluoride now used in most roach powders. Use a small hand dust gun to force the dust into cracks and crevices, along shelving, behind sinks, around pipes and in any other possible hiding places. Wipe away excess dust with a cloth. Allow time for the dust to take effect—one week may elapse before you notice any marked reduction in the roach population when dust is used.

For quicker results use a 5% DDT spray (either oil solution, suspension or emulsion). Force the spray into the hiding places described above, and any other places where roaches have been seen. Roaches actually hit with the spray generally die quickly.

A combination of spraying for immediate control plus residual dusting in places not reached by the spray is the most effective cockroach control.

Bedbugs. DDT has proved superior even to pyrethrum sprays formerly used to control these pests. A single treatment of 5% DDT spray properly applied to mattresses and bedsteads will "bugproof"

them for as long as 6 months. Use a small hand sprayer to force DDT solution into each crack and joint of the bed, also the springs. Spray all surfaces—top, bottom and sides—until they have a misty-wet appearance. Be sure to force the spray into seams and folds where bedbugs hide. Don't expect a complete kill until 48 hours after exposure of the bugs to the deposited DDT.

Fleas. Dust the infested rooms and basement thoroughly with 10% DDT powder, giving special attention to sleeping places or places where animals generally lie down. If left in place the treatment may control fleas as long as 80 days after dusting. *Never use DDT oil solutions on animals.* A 5% DDT spray (either in oil solution or in an emulsion) may be applied to the floors, rugs, furniture and sleeping places of the pets. Most dogs of average size may be safely dusted with about a tablespoon of 10% DDT powder. Cats, however, should not be treated with DDT dusts because they lick themselves and may swallow enough DDT to cause illness.

Warning—DDT dissolved in oil may be absorbed directly through the skin of animals with fatal results. Kerosene and other oils in themselves are poisonous to the skin. Several instances are already on record where valuable animals have been killed by spraying or dipping in DDT oil solutions.

Lice. Body lice are usually found in clothing and not on the body proper. Sift the 10% DDT powder over the entire inner surface of the underwear, taking special care to rub it into seams. The inside of the shirt, trousers, hat and other clothing should also be treated. One ounce (2 heaping tablespoons) of 10% DDT powder per treatment will remain effective for three weeks or longer if the clothing is not washed, although clothing treated in this way will still kill lice after one washing in warm soapy water.

Head lice. A teaspoon of 10% powder should be thoroughly rubbed into the hair. Since DDT does not kill eggs or nits, repeat the treatment in 8 to 10 days.

Crab lice. Lightly dust the affected parts with a 10% DDT powder. Repeat application in 8 or 10 days to kill any young lice hatched in the interval.

Brown Dog Tick. Use a 10% DDT powder, distributing the dust evenly over the dog's entire body. A coarse salt shaker can be used. One heaping tablespoon should be applied to the average sized animal. Rub the powder into the fur with an ordinary cloth glove or brush. Infestations in the home can be treated by applying 10% DDT powder or 5% DDT spray to cracks and crevices about baseboards, to floors, under sides of rugs and other floor coverings, window casing and other hiding places of the ticks. The dust kills ticks slowly. Leave it on fabrics, floors and other places for about two weeks, then wipe up powder or use vacuum cleaner. A second treatment may be necessary.

Ants. First try to find the points of entrance into the house. Treat these areas with a heavy spray deposit of DDT. Paint or spray 5% solution over the door sills, door frame, back steps, cupboard, shelves, drawers and other places where ants are seen. Dust ant hills or nests with 10% DDT powder and it will be carried down into the nest and gradually kill the whole colony. Don't spray them with oil solutions or emulsions.

Sand Flies. Paint screens with heavy application of 5% DDT solution and spray, or paint the walls and ceilings near lights. Treatment should be effective for several weeks.

Silverfish. The treatment recommended for cockroaches will be equally effective against silverfish.

Clothes Moths. Clothing can be protected from moth damage by spraying all surfaces with DDT in oil solution or emulsion before storing. A hand sprayer or vacuum cleaner sprayer can be used to apply a fine mist over the surface of the fabrics. The inside of closets, trunks and other storage places may also be treated.

Carpet Beetles. Spray rugs, carpets, clothing and upholstered furniture with DDT solution. Especially treat the angles of upholstered furniture, cracks about baseboard and other places where dust and lint collect.

Precautions in Using DDT

Although DDT is deadly to many insects, it is not harmful to man if properly handled. As with any insecticide, however, certain precautions are necessary in order to avoid any possible harmful effects.

1. Cover food, dishes and cooking utensils or remove them from room when spraying or dusting with DDT.

2. If DDT is swallowed accidentally, drink some mustard water immediately. This is made by adding one tablespoon of mustard to a glass of warm water. The mustard water will cause vomiting. Call or see a physician immediately.

3. DDT in oil solution is readily absorbed through the intestines and also directly through the skin. Never let DDT oil solutions remain on the skin or saturate clothing. Wash hands and exposed skin with warm, soapy water. If oil solutions or concentrates are spilled on clothes, change them promptly.

4. DDT in dust form may be absorbed through the skin if greases, oils or greasy skin lotions are already present on the skin.

5. Avoid inhaling the mist when spraying DDT. Ventilate the room while spraying.

6. Where extensive spraying is done, wear gloves, goggles and a respirator.

7. Do not apply DDT oil solution to the skin or fur of animals.

8. Do not substitute DDT for good sanitation and cleanliness.

Experiences in Filter Fly Control with DDT*

The effective use of DDT in elimination of insect pests has given rise to considerable speculation regarding its suitability for control of the psychoda fly in the vicinity of trickling filters at sewage treatment plants. Experiments in this direction have been divided into two types: First, those which attempt destruction of the adult flies by means of DDT application to the filter surroundings, and second, those which have applied the chemical directly to the filter medium in an effort to kill fly larvae.

Wisconsin experiments during the summers of 1944 and 1945 were limited to spraying DDT on areas near sewage filters either in emulsion form or dissolved in kerosene. At one plant a 3% emulsion was sprayed on the outside and top of the filter walls, the upper portion of the inside of the walls and the outer

*Contributed by Geo. F. Bernauer, Sr. Asst. State Sanitary Engr. of Wisconsin, as an appendix to Mr. Warrick's article written earlier.

six inches of filter medium, at a density of approximately 5 ounces of DDT per 1,000 square feet of area. In one case the fly nuisance near the filters and at the control building was reduced considerably and the treatment remained effective until heavy rains removed the DDT from the surfaces. In similar experiments at another plant the treatment was not nearly as effective.

At West Bend spraying of surroundings was almost entirely ineffective due to winds carrying the flies across sprayed areas to nearby residences. Construction of a temporary barrier in the form of two thicknesses of cheese cloth attached to 8 ft. high supports arranged around half the filter circumference was next undertaken. This barrier was sprayed with DDT solution in kerosene with the intent of killing the flies when they alighted on the cloth. While there was no wind the treatment appeared to be effective; however, moderately strong winds carried the flies over and around the barrier to the extent that they again appeared in considerable quantities at the residences.

In the past, application of DDT directly to the filter medium has been discouraged in Wisconsin because of the danger of toxic effect on fish in streams receiving plant effluent. As little as 0.07 ppm. of DDT will kill certain species. During the current summer, DDT has been applied to the filter influent at the Beaver Dam, Wisc., plant where a controlled stream flow permitted sufficient dilution for the period of DDT addition. A dose of 1.0 ppm. was applied continuously to the filter influent for two hours. No immediate benefits were noted but after three days the number of flies emerging from the filter had decreased to practically zero, and few larvae could be detected on the filter stone. Apparently DDT applied in this manner kills the larvae but has little or no effect on the adult flies. Ten days after treatment a severe fly nuisance again occurred. This experience indicates that DDT should be applied about every seven days in order to control the adult fly population satisfactorily. Tests of 5 day B.O.D. in the plant effluent before and after treatment indicated no impairment of plant efficiency by the DDT application.

Attempts have also been made to control flies by spraying the surface of the filter medium with a 10% solution of DDT in xylol at a density of 2 ounces of DDT per thousand square feet of area but the results have been unsatisfactory.

These experiments in Wisconsin seem to indicate that the most satisfactory method for use of DDT in control of filter flies lies in application of an emulsion to the filter influent in order to effectively reach the fly larvae (**Ed. Note**—This method has also been favorably reported upon by Hirsch in Louisiana, *W. & S. W.* June 1943—p. 250.) It must be certain, however, that the dilution afforded in the receiving stream is sufficient to prevent hazards to aquatic life. If it is not possible to secure such dilution, limited benefits may be obtained by application of areas near the filter as well as to other points in the plant grounds where nuisances occur.

N. Y. State Revises Sanitary Code

Chapters on "Cross Connections" and on "Operators" Amended

Regulation 8 of Chapter V of the New York State Sanitary Code deals with the installation and use of cross connections. Present provisions prohibit all cross connections except under four very definite conditions. These are briefly:

1. When the auxiliary supply is regularly examined and found potable.
2. When the potable supply is discharged into an elevated tank above the maximum elevation of the water level.
3. When special adjustable "swing joints" are provided and arranged under suitable hydraulic conditions.
4. In fire systems where double check valves are used and chlorination of the fire supply is provided through a special fire pump chlorinator.

It is condition No. 3 above, which has been revised by the elimination of the phrase "swing joints" and the substitution of the words "other protective devices." Thus the code now recognizes the various types of protective devices that have been developed and successfully used in cross connection conditions in the past few years.

In the matter of the certification of operators of water treatment plants the Sanitary Code (Sec. E of Chap. XI) has been amended in Regulations 35 and 36 so that the term operator now applies to any person engaged in the operation of a water supply furnishing water to the public whether that supply is owned or operated by a political body or by a private corporation.

The qualifications of such operators have been revised and amended to read that such an operator must hold a certificate of operator's qualifications *at the time of his employment* for the position. This regulation will apply to all new operators employed after Dec. 31, 1946, but will in no way affect any operators already employed prior to Jan. 1, 1947.

Northwestern Illinois Water Plant Operators Hold 7th Meeting at Galesburg

With R. E. Graham, Supt. of Water at Galesburg, acting as Host and Chairman, the Northwestern Illinois Water Plant Operators gathered at Galesburg, Ill., on Aug. 7 for their seventh annual meeting.

The meeting was held at the Elks' Club and featured "Maintenance of Water Wells" by members of the Illinois State Water Survey Staff, and "Fluorides in Drinking Water" by J. G. Weart, Chemist of the Illinois Dept. of Health. C. W. Klassen, Chief Engineer of the Illinois Dept. of Health, conducted an "Operators' Workshop."

A special afternoon trip included inspection of the main pumping station and the new Florence Street Well.

Hell - Hello; City Water Works?

(Cartoon by Carlson)

"I say, City Water Works, have you checked your sedimentation lately? We seem to be growing things since we last washed our floors!"

WATER AND SEWAGE PATENTS

(OF RECENT ISSUE)

WATER PATENTS

Composition Containing Active Chlorine. Earl W. Smith (to Solvay Process Co., New York); U. S. 2,393,716; Jan. 29, 1946; (Appl. 5-19-42). A solid mixture containing Chloramine-B and an acidic salt of an alkali metal.

Centrifugal Pump. Alexander V. Mueller (to The Deming Co., Salem, O.); U. S. 2,394,931; Feb. 12, 1946; (Appl. 12-9-43).

Pump. Alexander V. Mueller (The Deming Co., Salem, O.); U. S. 2,394,932; Feb. 12, 1946; (Appl. 1-11-44).

Water Treatment and Composition. Charles S. King (to Brockson Chemical Co.); U. S. 2,395,126; Feb. 19, 1946; (Appl. 1-25-44). A water-treating composition in the form of a water soluble glass consisting analytically of Na_2O_3, $A1_2O_3$ and P_2O_5 in definite compositions.

Treatment of Boiler Water. Harold C. Farmer, Rosemont, Pa., and Sheppard T. Powell, Baltimore, Md.; U. S. 2,395,260; Feb. 19, 1946; (Appl. 8-5-43). Maintenance of a constant ratio of sodium chloride to total solids in water used for steam generation.

These patent abstracts being brief do not necessarily cover the entire scope of the invention described. If the reader becomes especially interested in any of these patents he should obtain printed copies of the complete patent, at 10 cents each, from the Commissioner of Patents, Washington 25, D. C.

Treatment of Water for Boiler Feed. Charles E. Kaufman (to Hall Laboratories, Pittsburgh, Pa.); U. S. 2,395,331; Feb. 19, 1946; (Appl. 6-21-43). Maintenance of potassium ion in boiler water by passing some of the water through a base exchange medium to remove calcium, magnesium, and sodium.

Liquid Treatment. Robert E. Seddig (to Graver Tank & Mfg. Co., E. Chicago, Ind.); U. S. 2,395,508; Feb. 26, 1946; (Appl. 10-6-41). A circular water treating tank, with treatment section in the center and filters disposed annularly with filter drains, below.

Removal of Silica from Water. Paul C. Goetz (to The Permutit Co., New York). U. S. 2,401,924; June 11, '46 (Appl. 7-24-40). Process for removing silica from water at temperatures above 50 deg. C. by intimately mixing and agitating the water with an accumulation of a silica absorbing magnesium compound, and maintaining the proper amount of the slurry in the process.

SEWAGE PATENTS

Sewer Pipe Joint. Ernest Mark Davids (to Gladding, McBean & Co., Los Angeles). U. S. 2,401,554; June 4, '46; (Appl. 6-26-43). A bell and spigot joint with a rubber band on the spigot to help position it within the bell.

Method and Apparatus for Filtration. Clarence Lynn Peterson and Clarence J. Peterson, Salt Lake City, Utah. U. S. 2,403,021; July 2, '46; (Appl. 4-28-42). A double rotary vacuum filter with means for precoating filter to improve filtration.

Apparatus for Treating Sewage. James D. Walker (to American Well Works, Aurora, Ill.). U. S. 2,403,695; July 9, '46; (Appl. 12-4-41). A trickling filter with rotary distributor and means for recirculating liquid to maintain rate of flow.

Method and Apparatus for Treating Sewage. Augustus C. Durdin, III, Skokie, Ill. (24 per cent to Lewis H. Durdin and 52 per cent to Augustus C. Durdin, Jr.). U. S. 2,404,223, July 16, '46; (Appl. 3-2-42). An activated sludge process consisting of adding activated sludge to sewage without air and allowing mixture to react, separating therefrom the portion containing the lighter flocs, aerating the separated portion and using it as activated sludge to add to the incoming sewage.

Mississippi Enacts Stream Pollution Control

By an act of the State Legislature of Mississippi, the State Game and Fish Commission now has control of the streams and waterways, waste disposal therein and pollution thereof, in the state.

Industries discharging wastes at the time of enactment of the law must furnish complete data thereon, after which the commission will decide on the type and extent of treatment required, if any, and thereafter no alterations may be made in quantity or quality of the waste except with the approval of the commission. New industries must conform to pollution control standards before they begin operations.

The degree of treatment of wastes is to be based on conditions in the receiving stream 1000 ft. below the industrial waste outfall. At that point the following conditions must prevail.

a. No floating solids, scum, oil, or grease.
b. The pH must average between 6.5 and 8.4 with single sample limits of 5.0 and 9.5.
c. Salt concentration shall not be increased by more than 1000 ppm.
d. The D.O. shall not be below 4.5.
e. The wastes shall be non toxic to aquatic life.
f. Substances which impart foreign tastes to fish shall be absent.

As of July 1, 1946, all plans for sewage or waste treatment plants must have the approval of the commission and the commission shall have power to specify changes in treatment as necessary to meet the rules.

The commission has also issued strict rules regarding oil field wastes including the requirement that oil field brine, where possible, be discharged into underground wells below the fresh water level.

The Editor's Comments

A Seed Has Been Planted

The First Inter-American Sanitary Engineering Conference was held in Rio de Janeiro, June 10th-20th. Called by the Brazilian Ministry of Health and jointly sponsored by the Institute of Inter-American Affairs and the Pan-American Sanitary Bureau, the Rio Conference was attended by better than 200 engineers, chemists and water and sewage works operators from Argentina, Bolivia, Brazil, Chile, Paraguay, Uruguay and the United States of North America. This, the first Inter-American Conference of its kind, was considered a success. In consequence, a second is to be held during next month (September) in Caracas, Venezuela.

Several prominent sanitary engineers from this country attended the Rio Conference and most of these presented papers. Representing North America were such men as Wolman of Johns Hopkins University; Fair of Harvard; Baity of North Carolina; Ehlers of Texas; Whitaker of Minnesota; Streeter and Tarbett of the U. S. Public Health Service; Col. Harold Gotaas, President of the Inst. of Inter-American Affairs; Clarence Stirling, Chief Engr. of the Institute; Donald Snow, Chief Sanitary Engr. of the Pan-American Sanitary Bureau. There were equipment exhibits by some North American firms and the Water and Sewage Works Mfrs. Ass'n. of North America contributed financially in order that Proceedings of the Conference may be printed and distributed to those in attendance and others.

While *Water and Sewage Works* was not so fortunate as to be able to fly down to Rio (long a cherished desire since seeing the movie, "Flying Down to Rio"), we did enjoy token representation in the form of a new publication, a number of copies of which were flown down to Rio to reach there in time for making its official debut at the First Inter-American Sanitary Conference, where complimentary copies were distributed to many in attendance. We are making reference to the first edition of our *MANUAL DE INGENIERIA SANITARIA*, the Latin American counterpart of the annual Reference and Data Number of *Water and Sewage Works*, from various editions of which have been selected articles, graphs, conversion tables and engineering data for translation into Spanish by collaborating sanitary engineers and chemists in South and Central America.

We thought that we had made arrangements to have the Rio Conference reported for publication in this issue if not the July issue, but the report has reached us too late for insertion. Therefore, this page is being devoted to the highlights of this important Conference, which to us represents a development of marked significance, one which bids fair to constitute the initial step in bringing closer together the sanitary engineering profession in the Americas, including men directly connected with water supply and sewage disposal as well as the designing, administrative and supervisory group. In this direction we already have evidence of the possibilities of an affiliation between water and sewage works organizations in the Americas, for it was decided during the Rio Conference to establish the "Associacao Brasileira de Servicos de Aguas e Esgotos" (translated, "The Water and Sewage Works Association of Brazil") and the Acting Secretary, Edmund G. Wagner of the Inst. of Inter-American Affairs in Brazil, has already been instructed by resolution to inquire of the Am. Water Works Ass'n. and the Federation of Sewage Works Ass'ns. concerning the possibilities of an affiliation between the new Brazilian association and these two important North American associations.

Getting back to the Rio Conference, five days of technical sessions were followed by five days devoted to trips of inspection to such places as the Ipiranga Experimental Station for Sewage Treatment at Sao Paulo, Brazil, which had earlier been described and results obtained reported by Dr. Jesus Netto of the Sao Paulo Dept. of Water and Sewerage.

By special government planes a group visited the Governador Valdares in Brazil's Rio Doce Valley, where extensive water supply and sanitation projects are under way by the Servicio Especial de Saude Publica.

Ing. Plinio P. Whitaker, Director of Water and Sewerage, Sao Paulo, served as President Pro-tem of the Rio Conference. Serving as chairmen of the several technical sessions were: Ing. Juan J. Sbarbaro, Director of Sanitation, Ministry of Public Works, Uruguay; Ing. Luis Valenzuela, Supt. of Water, Santiago, Chile; Ing. Arturo Cullar of Bolivia; Ing. Juan Cameron, Director of Sanitary Engineering, Ministry of Health, Paraguay; Ing. Luis Mantillu, Chief San. Engr., Ministry of Health, Peru.

(We regret the impossibility of listing here the many speakers and their subjects.)

One of the most significant actions taken by the First Conference was that of petitioning the Second Conference, scheduled for Sept. 26th through Oct. 2nd, in Caracas, Venezuela, for action which will launch the formation of a permanent Inter-American Sanitary Engineering Association, designed to bring closer together the sanitary engineers of North, South and Central America.

Like the First Conference, the Second Conference is being sponsored by the Institute of Inter-American Affairs and the Pan-American Sanitary Bureau, with the Ministry of Sanitation of Venezuela cooperating. It will bring together engineers, chemists and others from Mexico, the Central American Republics, Cuba, Haiti, the Dominican Republic, Ecuador, Colombia, Venezuela and the U. S. of North America. Exhibits of equipment and inspection trips are being arranged to provide a well balanced educational and incentive program. Again, prominent North American engineers will attend. In charge of arrangements is Ernest W. Steel, formerly Prof. of San. Engineering, A. & M. of Texas, who is now Chief of Field Party, in care of the Inst. of Inter-American Affairs, Caracas.

This matter of initiating organizations of sanitary engineers and water and sewage works operators and managers on an Inter-American basis is just another splendid bit of work by the Inst. of Inter-American Affairs. It seems reasonable and far-sighted for the North American associations to make an especial effort to make affiliation between themselves and similar organizations in Latin America as effective and as helpful as possible with the least expense permissible to the individuals so benefitted. Such benefits may well prove to be mutual benefits in the long run, for the only difference in the matter of sanitation developments north and south of the Rio Grande is merely one of time.

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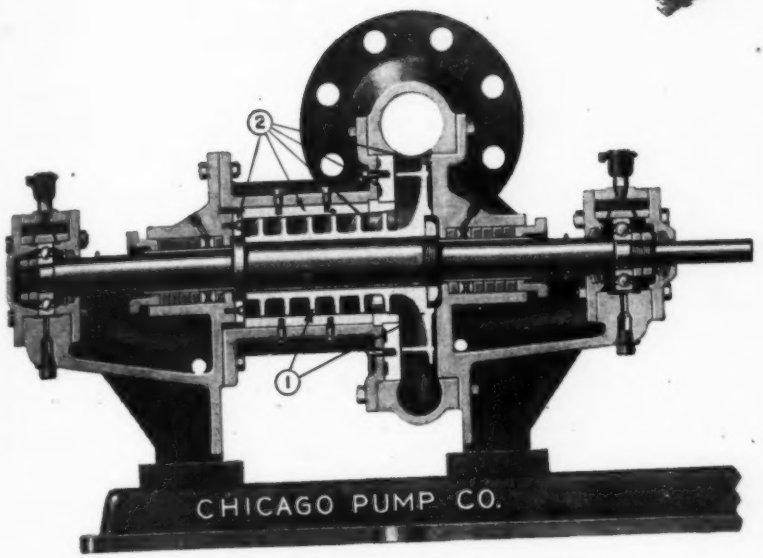

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MEETINGS SCHEDULED:

Aug. 24—LIVINGTON, N. J. (Doer's Grove)
New Jersey Sewage Works Association. (Annual Outing 12 Noon until 6 P. M.) Sec'y-Treas., S. A. Kowalchik, 427 Maple Ave., Trenton 8, N. J.

Aug. 26-28—STATE COLLEGE, PENNA. (Nittany Lion Inn)
Pennsylvania Water Works Operators' Association. Sec'y-Treas., I. M. Glace, 1001 North Front St., Harrisburg, Pa.

Aug. 28-30—STATE COLLEGE, PENNA. (Nittany Lion Inn)
Pennsylvania Sewage Works Asso. Sec'y-Treas., Bernard S. Bush, Penna. Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

Sept. 9-11—SAVANNAH, GA. (DeSoto Hotel)
Southeastern Section A.W.W.A. Sec'y, B. P. Rice, Healey Bldg., Atlanta 3, Ga.

Sept. 12-13—SANTA FE, N. MEX. (La Fonda Hotel)
Rocky Mountain Section A.W.W.A. Sec'y-Treas., O. J. Ripple, Supt. of Filtration, R.F.D. 2, Littleton, Colo.

Sept. 12-13—PITTSBURGH, PENNA. (Hotel Roosevelt)
Western Penna. Section A.W.W.A. Sec'y-Treas., E. P. Johnson, 418 Flannery Bldg, Sta. 13, Pittsburgh, Pa.
(Joint Meeting with)
Western Section Penna. Water Works Operators' Assn.

Sept. 16-18—ATLANTA, GA. (Georgia School of Technology)
Georgia Water & Sewage School (15th Annual). Sec'y, Van P. Enloe, Box 363, R.F.D. No. 5, Atlanta, Ga.

Sept. 17-20—POLAND SPRING, ME. (Poland Spring Hse.)
New England Water Works Assn. (Annual Meeting). Sec'y, W. C. Conroy, 609 Statler Bldg., Boston, Mass. (On Sept. 16, a pre-convention get-together will be held in the evening.)

Sept. 18-20—TRAVERSE CITY, MICH. (Park Place Hotel)
Michigan Section A.W.W.A. and Conference on Water Purification. (Joint Conference.) Sec'y-Treas., R. J. Faust, Michigan Dept. of Health, Lansing, Mich.

Sept. 20-21—DEADWOOD, S. D.
South Dakota Water & Sewage Works Conference. (Annual Meeting.) Dir. W. W. Towne, Div. of Sanitary Engineering, State Dept. of Health, Pierre, S. D.

Sept. 22-25—FORT WORTH, TEXAS (Hotel Texas)
American Public Works Congress. Exec.-Dir., D. F. Herrick, 1313 East 60th St., Chicago 37, Ill.

Sept. 26-27—MANDAN, N. D. (Hotel Lewis & Clark)
North Dakota Water & Sewage Works Conference. Sec'y-Treas., K. G. Lauster, State Dept. of Health, Bismarck, N. D.

Sept. 27-28—LANCASTER, PA. (Hotel Brunswick)
Four States Section A.W.W.A. Sec'y-Treas., H. Lloyd Nelson, 1624 Lincoln-Liberty Bldg., Philadelphia 7, Pa.

Oct. 3-4—ALBANY, N. Y. (Hotel DeWitt Clinton)
New York Section A.W.W.A. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York, N. Y.

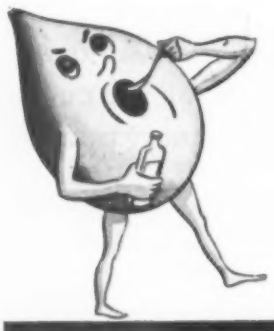
Oct. 7-9—TORONTO, CANADA (Royal York Hotel)
Federation of Sewage Works Assns. Exec.-Sec'y, W. Wisely, 625 Illinois Bldg., Champaign, Ill.

Canadian Institute of Sewage & Sanitation, Sec'y-Treas., Dr. A. E. Berry, Parliament Bldgs., Toronto, Ont.

Oct. 9—BANGOR, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

Oct. 10-12—COLUMBUS, O. (Hotels Fort Hayes — Chittenden)
Ohio Section A.W.W.A. Sec'y-Treas., F. P. Fischer, 811 Perry Payne Bldg., Cleveland, O.

(*Continued on Page* 90)



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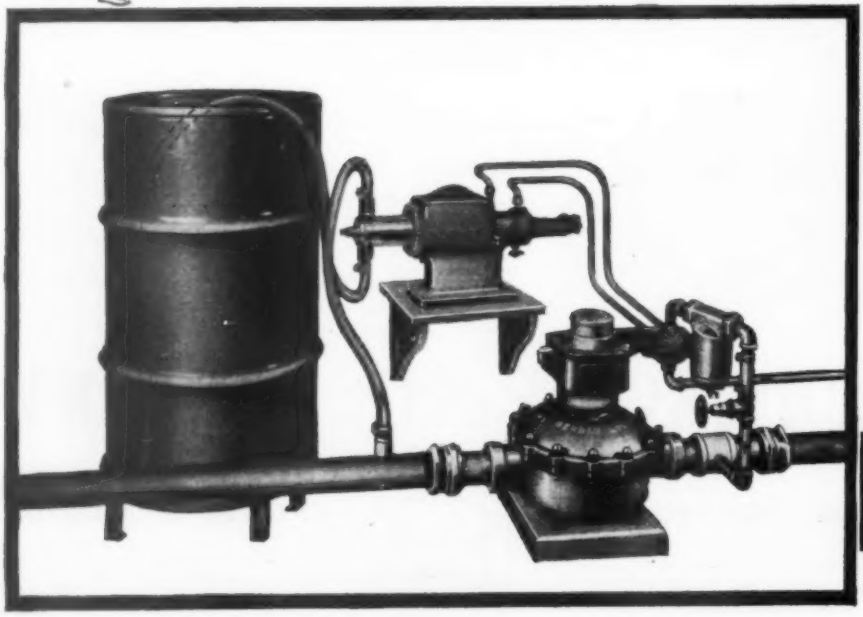

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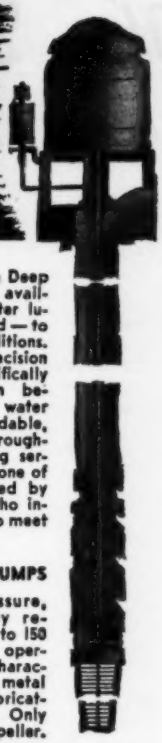

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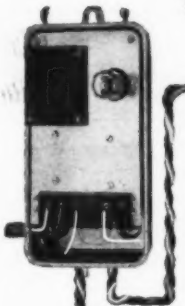

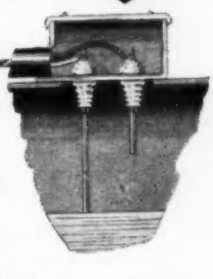

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MEETINGS SCHEDULED:

(*Continued from Page* 88)

Oct. 14-17—GALVESTON, TEXAS (Hotel Buccaneer)
Southwest Section A.W.W.A. Sec'y-Treas., Leslie A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

Oct. 16-18—ATLANTIC CITY, N. J. (Hotel Traymore)
Pennsylvania Water Works Association. Sec'y-Treas., R. R. Hannum, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 16-19—KANSAS CITY, MO.
American Society of Civil Engineers. Sec'y & Exec. Officer, William N. Carey, 33 West 39th St., New York, N. Y.

Oct. 17—BOSTON, MASS. (Parker House)
New England Section A.W.W.A. Sec'y, R. H. Ellis, Inspection Dept., Associated Factory Mutual Fire Insurance Co., 184 High St., Boston, Mass.

Oct. 17—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. (Executive Committee Meeting.) Sec'y, W. C. Conroy, 609 Statler Bldg., Boston, Mass.

Oct. 17-18—MORGANTOWN, WEST VIRGINIA (Hotel Morgan)
W. Virginia Section A.W.W.A. Sec'y, J. H. Harrington, State Dept. of Health, Charleston, W. Va.

Oct. 23-25—SAN FRANCISCO, CALIF. (Hotel Whitcomb)
California Section A.W.W.A. Sec'y-Treas., Ray L. Derby, Box 3669 Terminal Annex, Los Angeles 54, Cal.

Oct. 28-30—PITTSBURGH, PA. (Hotel William Penn)
Engineers' Society of Western Penna. (7th Annual Conference.) Chairman, H. M. Olson, Wm. Penn Hotel, Pittsburgh, Pa.

Oct. 28-30—KNOXVILLE, TENN. (Hotel Andrew Johnson)
Kentucky-Tennessee Section A.W.W.A. Sec'y-Treas., R. P. Farrell, Dir. of San. Eng., State Dept. of Health, 429 Sixth Ave. N., Nashville, Tenn.

Nov. 7-9—ATLANTIC CITY, N. J. (Hotel Chelsea)
New Jersey Section A.W.W.A. Sec'y-Treas., C. B. Tygert, Box 178, Newark, N. J.

Nov. 11-13—RALEIGH, N. C. (Hotel Sir Walter Raleigh)
North Carolina Section A.W.W.A.
(Joint Meeting with)
North Carolina Sewage Works Association. Sec'y-Treas., (both Assns.) Geo. S. Moore, Box 125, Albemarle, N. C.

Nov. 11-15—CLEVELAND, OHIO (Public Auditorium)
American Public Health Association. (74th Annual Meeting.) Exec.-Sec'y., Reginald M. Atwater, 1790 Broadway, New York, N. Y.

Nov. 14—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. Sec'y., W. C. Conroy, 609 Statler Bldg., Boston, Mass.

Nov. 14-15—RICHMOND, VA. (Hotel John Marshall)
Virginia Section A.W.W.A. Sec'y-Treas., W. H. Shewbridge, State Dept. of Health, 1506 Greycourt Ave., Richmond, Va.

Nov. 15-17—GREEN BAY, WIS. (Hotel Northland)
Wisconsin Section A.W.W.A. Sec'y-Treas., L. A. Smith, Supt. of Water, City Hall, Madison 5, Wis.

Nov. 22-24—HAVANA, CUBA
Florida Section A.W.W.A. Sec'y-Treas., Prof. A. P. Black, University of Florida, Gainesville, Fla.
(Joint Meeting with)
Cuban Section A.W.W.A. Sec'y, Laurence H. Daniel, P.O. Box 531, Havana, Cuba.

Dec. 11—AUGUSTA, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

Dec. 19—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. Sec'y-Treas., W. C. Conroy, 609 Statler Bldg., Boston, Mass.

Here and There with Doc Symons

On the Shores of Lake Erie. This particular effusion is pouring from my pen on the Canadian Shore of Lake Erie, some 15 miles from Buffalo, scene of some of my past endeavors. It is warm today, almost hot; even under a beach umbrella the sun's piercing rays in a cloudless sky are turning my bald pate a bright pink.

The water gently laps at the sand a dozen feet away. Sharing the umbrella's shade is that girl known as "Gin" among our friends. Half hidden in the foliage and perched atop the sand dune, which rises precipitously at the back of the beach, is the lovely summer home of our hosts, the Johnsons, Johnnie and Kay, whose lovely picture adorned this column last month.

The haze over the water shuts out the metropolis and its industrial waste problem across the Lake. For a moment the broad expanse of water, the long curving line of shore, the quiet stillness of the air itself make deadline jitters seem far away. Now there is only today, my wife, our friends, that water shimmering in the sun, and I enjoying them all; even the trip back to New York tonight is in the dim and distant future. This is the setting in which to write, about friends, about people, about things; so here's the August column from the Shores of Lake Erie.

* * *

Pity the folks down under. At Broken Hill N.S.W. it is necessary to carry water by trainloads in order to maintain the water supply. Twenty-eight water trains a week, I read somewhere.

* * *

Wish I could remember who said it. I'm sure it was at Purdue at the Indiana Sect. AWWA meeting that someone in commenting on public re-

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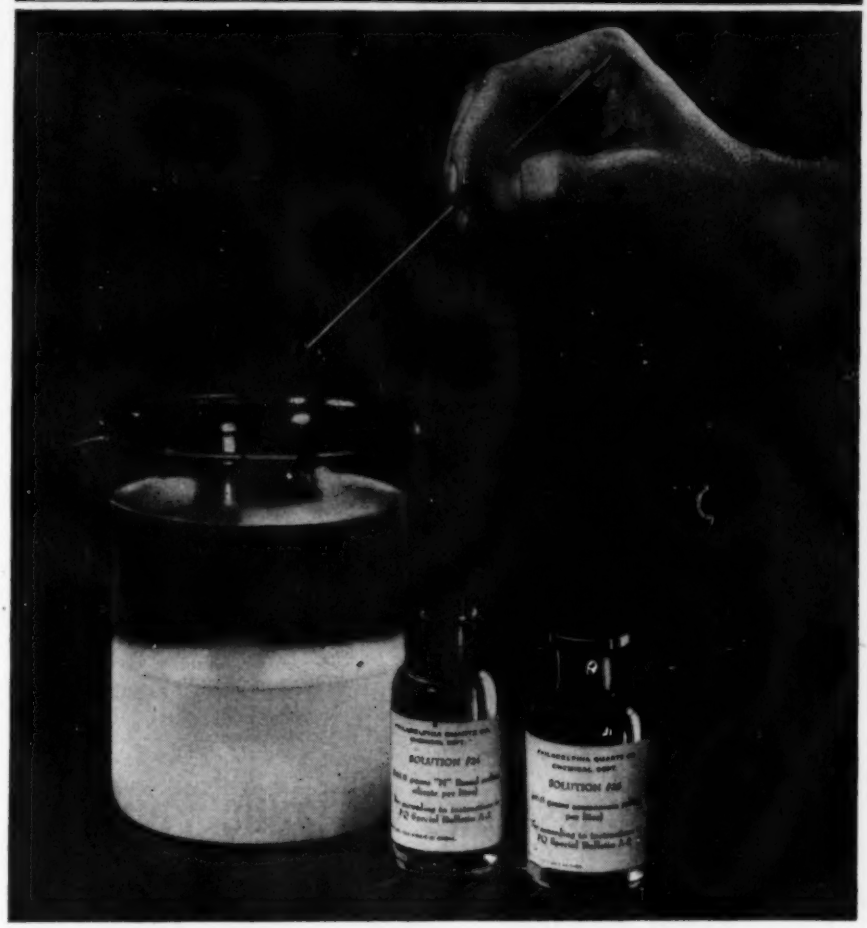

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lations and repair problems, etc., said, "Not one person in a thousand knows where to shut off the water in his own house." To prove his point, the speaker asked the audience for a show of hands on the question. Even those water works men only rated about fifty per cent. That reminds me, I must look in my basement when I return home.

* * *

I don't know how they do it. It seems that men connected with the field of water and sewage treatment have a faculty for marrying very, and I mean *very* attractive and lovely ladies. Two that I recently met at the Central States Sew. Wks. Meeting in Purdue, were Margaret (Mrs. Don) Bloodgood, and Charlene (Mrs. Frank) Lovett. Was awfully glad to see Clarinda (Mrs. W. D.) Hatfield again, too.

* * *

E. A. "Sig" Sigworth who edits the *Taste and Odor Control Journal*, quoted one time from *Drug and Cosmetic Industry*, to the effect that a vanillin tablet when put in water that had a chlorine taste, not only killed the taste of chlorine but left no taste of its own. Anything new on this method of dechlorination, Sig?—I should think it might be rather expensive but for campers who treat their water bottles with chlorine tablets, hypochlorite, etc., it sounds O.K.

* * *

Met another one of my feminine readers on my last trip to the Midwest. **Mary Summers,** by name, and you people who read *Sewage Works Journal*, might do well to remember that name. Mary is the major domo of the office of the Federation of Sewage Works Associations in Champaign. It is she who does all the work on *S.W.J.*, all of the work, that is, that "Pete" Wisely doesn't have time to do.

I can't leave the matter of that trip to Wisely's office without mentioning that I found out why I am listed in the last membership list (March, 1946) as a chemist for *Water & Sewage Works*, New York. Seems as though I should have sent them a change of occupation a few years back when I sent them a change of address.

I had originally intended to write something about being listed as a chemist as a gag to kid Homer Wise-

ly, but after seeing the very neat filing system that Homer has worked out for the membership records, I thought I'd better own up to the error as mine. And, may I suggest that if any of you fellows are listed incorrectly it might be well to send the Federation the correct information.

By the way Homer, if you'd take Mary to the Toronto Meeting this Fall, you wouldn't, in the words of Swede Larson, be "going off in all directions" as you carry on the Secretary's work at the biggest convention the Federation has ever had.

* * *

Glancing through Ed. Jack Service's *Sparling Metrograms*, I ran across this item:—"It is said that the average human says 73,000 words each day. And I find it hard to find 2000 words a month worthy of enshrining in these chaste pages." Perhaps, Jack, the answer lies in the fact that probably not a hundred of those 73,000 spoken words are worthy of enshrining on any page—"chaste" or otherwise.

* * *

I've been meaning to tell you. A. J. Krell, one-time associate of "Bill" Raisch, and during the war a member of the Sanitary Corps, is now in Buffalo, N. Y., working for the National Aniline and Chemical Co. on the problem of industrial waste treatment and disposal.

As a malaria control officer in the Philippines, Capt. Krell had the only feminine unit of sanitary latrine inspectors in the Army on Leyte Island. His problems in Buffalo will be slightly different, but perhaps no less difficult.

* * *

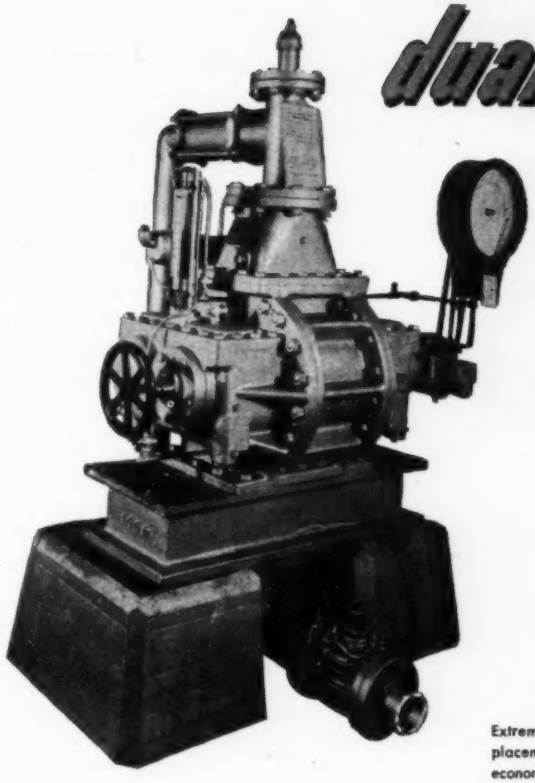
While on the inspection trip of the Bridgeport Hydraulic Company's Saugatuck Dam, I looked back at the car behind us and noted the Connecticut license plate bore just the letters WTCO. Now Connecticut licenses often have only letters and no numbers, but for some reason that combination seemed to strike a responsive cord in my memory. When we stopped some time later and W&T's Ed. Rothman stepped out of the car following us, then I knew—.

* * *

This seems to be a particularly appropriate time to recall that it was just three years ago, almost to the very day, that I wrote the first of these columns. This is the 36th; one having been lost to posterity as a

METERING YOU CAN BANK ON...with R-C

dual-ability



R-C Positive Displacement Meters accurately measure from 5% to 150% of their normal ratings.

ROTARY POSITIVE

Extreme simplicity of R-C Rotary Positive Displacement principle enables you to account economically for every cubic foot of gas metered through these units.

• You get accurate measurement of gas or liquid with Roots-Connersville Positive Displacement Meters.

Accuracy is assured by the simple, correct design of the meter, with its absence of small parts, impossibility of tampering and complete freedom from adjustments.

This simplicity naturally leads to low cost per cubic foot of measuring capacity and extremely low maintenance cost over many years. Combined, R-C accuracy and low cost metering give you *dual-ability* not obtainable in any other meters.

Ask for Bulletin 40-B-13, or for engineering assistance to select the correct meter for your specific needs.

ROOTS-CONNERSVILLE BLOWER CORPORATION
One of the Dresser Industries
608 Mount Avenue, Connersville, Indiana

Roots CONNERSVILLE SINCE 1854

ROTARY POSITIVE GAS METERS

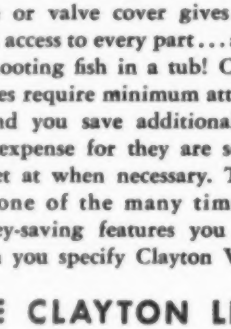
ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

WHEN YOU USE
CLAYTON VALVES

QUICK, easy access to all working parts of Clayton Valves is provided on *top* of the valve. There is no necessity for having to allow for room to get at the Clayton Valve from the bottom. There are no complicated parts to disassemble. The large diameter top plate or valve cover gives wide-open access to every part... as easy as shooting fish in a tub! Clayton Valves require minimum attention ...and you save additional time and expense for they are so easy to get at when necessary. This is but one of the many time-and-money-saving features you enjoy when you specify Clayton Valves.

THE CLAYTON LINE

includes Remote Control Valves, Float Control Valves, Altitude Valves, Check Valves, Constant Discharge Pressure Valves, Pump Control Valves, Backflow Prevention Units.



Write for Engineering Data
VALVE DIVISION
CLAYTON MANUFACTURING CO.
Chicago • Alhambra, Calif. • Philadelphia

result of the printers' strike and our Bob-tail issue of last October.

I remember how I approached our editor with the idea for this column. I'd always wanted to write a column and I made up a rather lengthy outline of what I proposed to do and how. I was pleased when he said, "O.K."

I've been pleased at the response to my efforts. I've been flattered no end, when various persons have told me that my column is the first thing they read when *Water & Sewage Works* arrives. I've been equally flattered to find that I have so many feminine readers. But my bulging ego has been kept from bursting by learning at times that some persons don't even know this column is published in **W.&S.W.** And that same ego is kept whittled down to near normal size by the knowledge that no advertiser has yet requested space alongside of **Here and There with Doc Symons**, let alone considering it a premium location as are certain other spots in the book.

In recalling the outline I proposed for the column, it appears that I haven't strayed very far but I've learned a lot in three years; I've learned to "be myself" and not to editorialize in the vein or style of others; I've learned to write "I" instead of the editorial "we," lest some readers get the wrong impressions from these strictly "personal views of the news"; I've learned that some readers like short pithy items, others like longer stories, and some even like items such as this, when I talk about myself.

I've been called a crank, a griper, a Walter Winchell, and a Westbrook Pegler of the Sanitary Engineering Field. No one has likened me to Odd McIntyre or Ernie Pyle, both of whom I'd rather emulate as to literary style, ability, and accomplishment, than either of the other two gentlemen of the Fourth Estate.

Much as I'd like to have them, few contributions have found their way to my mail box—Please!—I could use more. A few friends have written the kind of letters that encourage one to continue, I hope that in the next year there will be more —an actor, even a Ham, likes applause.

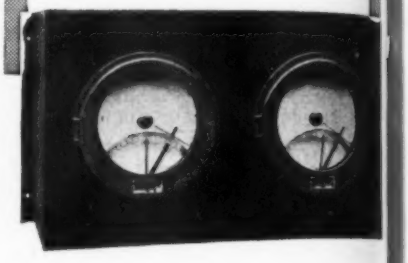
It's time to go back to the city. I hope your whole vacation has been as pleasant as this day has been to me. See you around when the meetings start this Fall.—V.T.Y. Doc.

L&S

STEVENS
Type B
RECORDER

...does 3 jobs well

- *Records and indicates head or flow.*
- *Totalizes flow.*



The user list of Stevens *Type B* Recorder reads like a Blue Book. Reason—the instrument is particularly adapted to waterworks, sewerage and industrial applications—and is equally suitable to any class of recorder service.

Type B is really *triplets*. It records and indicates either head or rate of flow and registers total volume passed in any elapsed time.

Circular charts are used and may be had for daily or weekly operation.

The *Type B* is direct float operated or remotely controlled. Quality 8-day or electric clock is standard equipment. The recorder can be mounted on wall, pedestal, panel, or in sewer manhole. It can be hermetically sealed against corrosive fumes.

Want more information about this 3-way wonder? Write for Bulletin 25.

LEUPOLD & STEVENS INSTRUMENTS
Manufacturers since 1907
PORTLAND 13, OREGON
Hydrographic • Surveying • Navigation
Automatic Controls

Leupold & Stevens Instruments
4445 N. E. Glisan St., Portland 13, Oregon
Please send Bulletin No. 25 on the Stevens *Type* B Recorder.

Name _____
Organization _____
Title _____
Street _____
City _____ *Zone* *State* _____

THE SPILLWAY

[Overflow from the main section]

Water and Sewage Works Projects

Recent Federal Loans for Construction Plans

LAST August *Water Works and Sewerage* began the listing of water and sewage works projects for which the Federal government had made loans for the preparation of the plans. These funds which are made available through the Bureau of Community Facilities of the Federal Works Agency are to be repaid when construction is begun.

In August were listed 61 communities (77 projects) in 21 states; in September, 100 communities (122 projects) in 27 states, in November 165 communities (206 projects) in 35 states, and in our April issue, 526 communities (629 projects) in 46 states.

Between March 15 and July 1, the Bureau of Community Facilities announced the issuance of loans for plan preparations to 346 communities for 423 projects in 42 states.

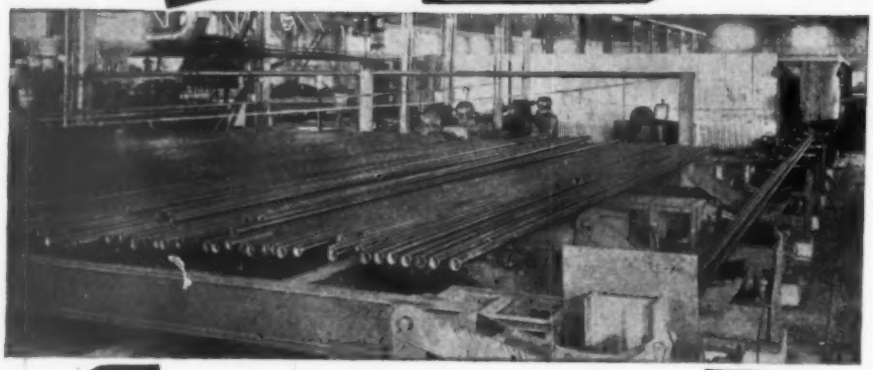
Communities receiving these most recent loans and the estimated cost of the completed projects are listed herewith by states.

Community and Facility	Estimated Cost
Alabama	
Bessemer (water)	$ 250,00
Decatur (sewage)	31,43(
Florala (sewage)	123,'5
Florala (water)	88,1(
Foley (sewage)	72,60(
Fort Deposit (sewage)	69,7??
Homewood (sewage)	210,?0'
Phenix City (sewage)	318,00(
Piedmont (sewage)	30,55?
Thomaston (water)	35,?0
Vincent (sewage)	106,51
Arizona	
Somerton (sewage)	110,842
Arkansas	
Amity (water)	48,61(
Calico Rock (sewage)	65,8(0
Conway (sewage)	95,66
Conway (water)	116,01?
Corning (sewage)	35,18(
Corning (water)	58,07(
Imboden (sewage)	38,450
Imboden (water)	43,900
Mansfield (sewage)	53,252
Mountain View (sewage)	64,704
Smackover (sewage)	121,000
State Sanatorium, Logan Co. (sewage)	57,000
Trumann (sewage)	76,669
California	
Los Angeles (sewage)	5??,000
Lynwood (water)	99,500
Marin Co. San. Dist. No. 2 (sewage)	131,0?0
Mokelume (sewage)	38,240
No. Sacramento (sewage)	154,503
Novato San. Dist. No. 6 (sewage)	166,000

PRODUCTION
FROM GLAUBER'S modern plant to the Nation's communities flows a steady stream of "Red Brass" ground key work which is unsurpassed for smooth, easy operation and long life service. Designed with a mechanically perfect taper that is free of overlap, these full opening keys and stops are permanently lubricated with Glauber's Special Valve Grease Formula which will not deteriorate even under excessive heat or cold.
Over 50 years of experience in ground key design plus new precision methods have made possible this improved Glauber's line of ground keys and stops.
Write today for quotations and estimated delivery on your specific waterworks requirements.
THE Glauber BRASS MFG. CO., KINSMAN, OHIO
Division of H. B. SALTER MFG. CO.
Marysville, Ohio
Glauber
RED BRASS

HILL, HUBBELL PRECISION HANDLED

STEEL PIPE PROTECTION



Simplified production handling of Steel Pipe at our plants is an important factor in time economy. The precision movement of the pipe by conveyor system, starting with mechanical cleaning, through machine priming—multi-coating—and—wrapping, is an uninterrupted process.

Your order regardless of size, receives prompt attention in its respective scheduling.

You can depend on HILL, HUBBELL pipe protection arriving at destination in excellent condition.

GENERAL PAINT CORPORATION

HILL, HUBBELL & CO. · Division · Cleveland, Ohio

· EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. ·

Community and Facility	Estimated Cost
Oceanside (sewage)	105,000
Santa Barbara (sewage)	437,620
West Covina (water)	146,750
Colorado	
Canon City (sewage)	214,557
Connecticut	
Middleton (sewage)	159,250
Middleton (sewage)	219,500
Rockville (sewage)	360,500
Delaware	
Selbyville (sewage)	215,611
Florida	
Coral Gables (sewage)	561,556
Florida City (water)	48,300
High Springs (water)	104,670
Jacksonville (water)	278,450
Jacksonville (water)	671,373
Milton (water)	55,000
Palm Beach (sewage)	1,050,000
Starke (water)	59,357
Tampa (sewage)	1,114,623
Georgia	
Cochran (water)	136,000
Danielsville (water)	33,000
Edison (sewage)	89,100
Gordon (sewage)	104,816
Manchester (water)	96,632
McRae (water)	64,402
Monticello (water)	59,200
Moultrie (water)	172,171
St. Mary's (sewage)	115,121
Warrenton (water)	54,931
Idaho	
Alameda (sewage)	40,000
Alameda (water)	20,000
Boise City (sewage)	600,000
New Meadows (sewage)	35,000
New Meadows (water)	15,000
Orofine (water)	65,000
Salmon (sewage)	123,000
Illinois	
Arenzville (water)	70,000
Armington (water)	39,500
Aroma Park (water)	60,000
Athens (sewage)	104,785
Atlanta (sewage)	121,000
Augusta (sewage)	118,222
Bloom Tnshp. (sewage)	14,700
Bloom Tnshp. San. Dist.	321,000
Braidwood (water)	66,510
Cambridge (sewage)	72,400
Canton (sewage)	44,500
Canton (water)	18,000
Chicago (sewage)	800,000
Chicago (sewage)	1,200,000
Chicago Heights (sewage)	77,000
Chicago Heights (water)	115,600
Chillicothe (sewage)	154,170
Clinton (water)	87,000
Danville (sewage)	67,435
Danville (sewage)	283,944
Decatur (sewage)	532,000
Du Quoin (water and sewage)	82,000
East Galesburg (water)	71,000
East Peoria (water)	93,500
Equality (water)	100,500
Eureka (sewage)	173,000
Flossmoor (water)	27,930
Frankfort (sewage)	80,250
Franklin Grove (sewage)	90,000
Greenville (sewage)	32,000
Hoyleton (water)	54,000
Kankakee (sewage)	762,000
Kinmundy (water)	127,100
La Salle (sewage)	215,000
Lebanon (sewage)	83,500
Leyden Tnshp. (water)	222,000
Louisville (sewage)	109,025
Marissa (water)	30,100
Matteson (water)	18,200
Metamora (sewage)	99,000
Monmouth (sewage)	75,400
Monmouth (sewage)	112,200
Monmouth (sewage)	125,400
Murrayville (water)	66,971
Neponset (water)	47,132
New Canton (water)	72,522
Paw Paw (sewage)	80,000
Potomac (water)	85,000
Quincy (sewage)	1,000,000
Rock Falls (sewage)	326,000
Salem (water and sewage)	200,000
Schram City (water)	51,925
Shannon (sewage)	80,000
Shelbyville (water)	85,000
Steger (sewage)	4,692
Steger (water)	61,200
Stewardson (sewage)	83,000
St. Marie (water)	43,800
Stockton (sewage)	120,000
Swansea (sewage)	85,000
Table Grove (water)	105,000
Tampico (water)	16,900
Taylor Springs (water)	46,453
Tinley Park (water)	33,000
Tremont (water)	20,000
Viola (sewage)	67,000
Washburn (sewage)	92,220
Washburn (water)	14,210
Wilsonville (water)	150,000

REPAIR and SAVE

Water Meter Measuring Chambers

with the

MEMPHIS SLOT INSERT

of stainless steel with new bronze thrust roller.

For further information and *free* ⅝" samples address

METER SPECIALTY CO.

1332 N. Seventh St. Memphis, Tenn.

SAVE *with* TENNESSEE CORPORATION Ferri-Floc FERRIC SULPHATE

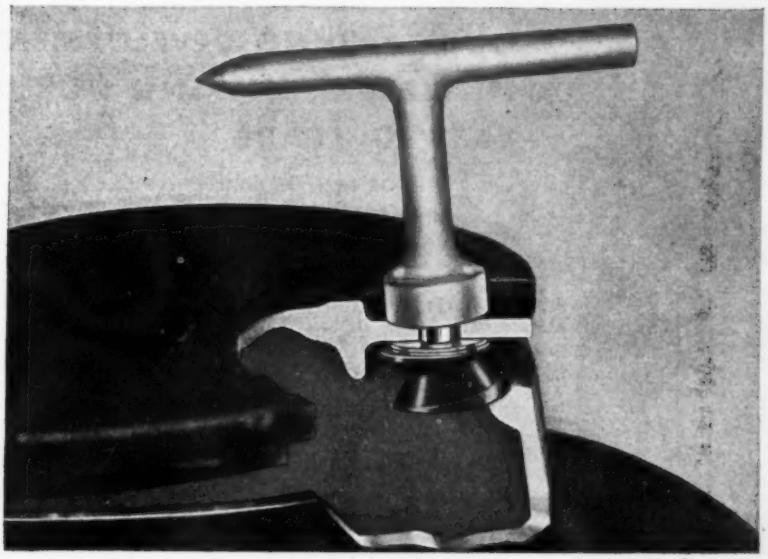
Write today for actual case histories of plants now using the ideal ferric coagulant.

TENNESSEE CORPORATION

Atlanta, Georgia Lockland, Ohio

	Estimated Cost
Indiana	
Alexandria (sewage)	203,300
Gosport (sewage)	63,964
Greencastle (sewage)	142,211
Hamlet (sewage)	54,016
Indianapolis (sewage)	1,325,932
Indianapolis (sewage)	1,504,484
Kalamazoo Tnshp. (sewage)	501,632
Knox (water)	33,000
Marengo (water)	91,750
New Haven (water)	109,649
South Westnedge (sewage)	655,354
Iowa	
Adel (sewage)	98,900
Chariton (sewage)	236,520
Dubuque (sewage)	1,010,000
Hartley (sewage)	58,250
Le Claire (sewage)	114,600
Marathon (sewage)	66,100
Moravia (sewage)	60,500
Moravia (water)	37,500
New Albin (sewage)	85,000
Norway (sewage)	67,600
Sergeant Bluff (sewage)	47,470
Sheldon (sewage)	102,900
Kansas	
Council Grove (sewage)	8,490
Council Grove (sewage)	12,500
Council Grove (sewage)	27,319
Council Grove (sewage)	29,092
Deerfield (sewage)	27,650
Deerfield (water)	37,500
Kansas City (sewage)	108,000
Kansas City (sewage)	689,000
Kensington (sewage)	74,000
Lindsborg (water)	139,000
Mission Tnshp. (water)	57,550
Silver Lake (sewage)	44,000
Silver Lake (water)	26,600
Thayer (water)	35,600
Wyandotte Tn. Sew. Dist. No. 1 (sewage)	77,625
Kentucky	
Albany (sewage)	156,378
Benton (sewage)	22,970
Edmonton (water)	38,199
Fordsville (water)	45,553
Hopkinsville (sewage)	223,416
Owensboro (sewage)	1,058,450
Shepherdsville (sewage)	77,932
Upton (water)	68,860
Williamstown (water)	61,600
Louisiana	
Bernice (water)	29,165
Lafayette (sewage)	260,000
Lafourche Parish Water Dist. (water)	1,650,000
Maine	
Winthrop Water Dist. (sewage)	193,200
Massachusetts	
Ashland (sewage)	361,200
Hatfield (water)	140,645
Ludlow (sewage)	104,093
Rowley (water)	211,000
Michigan	
Armada (sewage)	27,550
Bad Axe (sewage)	85,000
Constantine (sewage)	170,000
Grand Rapids (sewage)	57,200
Grand Rapids (sewage)	77,217
Grand Rapids (sewage)	86,842
Grand Rapids (sewage)	177,979
Kalamazoo Tnshp. (sewage)	487,245
Lakeview (water)	161,065
Lansing Tnshp. (sewage)	351,000
New Baltimore (sewage)	198,500
Saline (sewage)	100,000
Three Rivers (sewage)	350,000
Traverse (water)	228,000
West Highland (water)	61,984
Minnesota	
Brewster (sewage)	49,350
Grand Rapids (sewage)	225,540
Hibbing (sewage)	661,750
Hokah (sewage)	65,000
International Falls (sewage)	366,875
Karlstad (water)	53,946
Maple Lake (water)	7,040
Mountain Lake (sewage)	150,455
Pequot Lakes (water)	50,511
So. International Falls (sewage)	73,029
Waldorf (sewage)	44,450
Waldorf (water)	50,000
Warren (sewage)	40,000
Mississippi	
Anguilla (water)	64,077
Bruce (sewage)	76,500
Bruce (sewage)	78,500
Cruger (water)	27,500
Greenwood (sewage)	212,370
Hazelhurst (sewage)	124,434
Hazelhurst (water)	107,018
Mendenhall (sewage)	37,275
Ripley (sewage)	22,800
Roxie (water)	7,500
Missouri	
Clinton (sewage)	62,073
Grower (water)	40,500

The *Key* to all Good METER BOX COVERS



The Ford Lifter Worm Lock is first of all a strong, secure lock to hold the lid tightly on the meter box, preventing accidents to pedestrians and damage to the meter.

The FORD WORM LOCK

When the meter reader places his key on the forged Everdur bolt and turns it the lid is forced upward by a powerful screw-jack action which breaks any seal of ice or dirt. *Then* with the lid unlocked the key is automatically attached to the bolt and serves as a handle for lifting. The action of locking automatically disengages the key. The meter reader doesn't need to touch the lid. For over 35 years the Ford Lifter Worm Lock has been proved and improved.

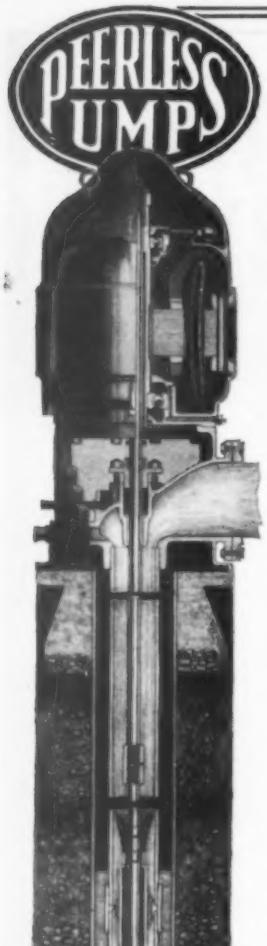
The Lifter Worm Lock is standard and exclusive on all Ford Meter Box Covers. Here are four of the 12 sizes of Type C Single Lid Covers.

SEND FOR OUR CATALOG

The

FORD METER BOX COMPANY, INC.,

WABASH, INDIANA



HI-LIFT
REG. U. S. PAT. OFF.
PUMPS

The OUTSTANDING DEVELOPMENT IN WATER PUMPING IN THE LAST 10 YEARS • • • • •

FOR DEEP OR SHALLOW WELLS
CAPACITIES: 600-3300 GALS. PER HOUR

"Squeezes Water Upward"

The magic pumping element of the Hi-Lift consists simply of a helically contoured, stainless steel rotor: scientifically heat-treated and chrome plated. This shaft revolves slowly within a special cutless rubber stator: also helically contoured. Slow, smooth, continuous pumping action is created, "squeezing the water upward." Extremely high pressure may be developed.

The Hi-Lift is water lubricated—no oil is used underground. The only moving parts are rotor and shaft. Can be installed in wells as small as 4" in diameter. The Peerless Hi-Lift is the ideal source for pumping clean water in a wide variety of municipal, industrial and commercial applications. Request Literature.

- NO PRIMING
- NO OIL BELOW THE SURFACE
- FOR ALL PRACTICAL LIFTS WITHOUT PUMPING ELEMENT CHANGES
- MAXIMUM RESISTANCE TO ABRASIVE ACTION

PATENTS: Manufactured under R. Moineau patents U. S. 1892217 and 2028407; Canadian Patents 352574. By exclusive license to Robbins & Meyers, Inc. Peerless U. S. Patents Nos. 2208975, 2338937 and 2346426. Other patents pending.

PEERLESS PUMP DIVISION
Food Machinery Corporation

Canton 6, Ohio • Quincy, Illinois • Los Angeles 31, Calif.

Distributors in Principal Cities

Community and Facility	Estimated Cost
Kennett (sewage)	81,000
Kirksville (sewage)	348,930
Lebanon (sewage)	102,300
Lockwood (sewage)	93,000
St. Louis (sewage)	1,200,000
Montana	
Deer Lodge (water)	64,370
Drummond (water)	60,000
Dutton (sewage)	72,040
White Sulphur Springs (water)	68,200
Nebraska	
Danbury (water)	26,921
New Hampshire	
Rochester (sewage)	300,000
Winchester (water)	210,600
New Jersey	
Garfield (sewage)	22,395
Garfield (sewage)	23,910
Kearney (sewage)	830,000
Maywood (sewage)	101,750
So. Orange (sewage)	416,000
New Mexico	
Dexter (water)	50,000
Raton (sewage)	43,350
Socorro (water)	137,350
North Carolina	
Asheboro (sewage)	165,000
Asheboro (sewage)	430,000
Den on (water)	155,515
Draper San. Dist (sewage)	234,000
Draper San. Dist. (water)	116,000
Dunn (sewage)	175,000
East Spencer (water)	22,000
Graham (water)	222,000
High Point (sewage)	192,553
High Point (water)	300,000
High Point (water)	150,000
Magnolia (sewage)	22,000
Mooresville (sewage)	211,000
Mooresville (sewage)	260,000
Mooresville (water)	543,350
Roanoke Rapids San. Dist. (sewage	92,000
Roanoke Rapids San. Dist. (water)	105,000
Rutherfordton (sewage)	62,000
Spindale (sewage)	19,000
Spindale (sewage)	32,500
Spindale (sewage)	49,500
Waynesville (water)	41,100
Waynesville (water)	179,300
Whiteville (sewage)	212,965
Wilmington (sewage)	1,500,000
Winston-Salem (water)	2,550,000
North Dakota	
Aneta (water)	5,500
Aneta (water)	74,300
Cando (sewage)	23,500
Cando (sewage)	35,000
Cando (water)	16,000
Fessenden (water)	176,900
Harvey (sewage)	30,360
Harvey (sewage)	91,300
Harvey (water)	26,400
Harvey (water)	30,800
Hat on (sewage)	105,000
Hope (sewage)	45,000
Hope (water)	5,500
Hope (water)	42,500
McVille (sewage)	28,500
Minnewaukan (water)	5,500
Minnewaukan (water)	57,800
Neche (water)	49,500
Neche (water)	59,200
Pembina (sewage)	63,800
Pembina (water)	45,600
Pembina (water)	16,500
Ohio	
Arcanum (sewage)	203,600
Ashtabula (water)	85,337
Barberton (sewage)	103,950
Barberton (sewage)	126,500
Barberton (water)	220,000
Blanchester (sewage)	224,900
Bucyrus (sewage)	278,000
Cortland (sewage)	137,500
Cortland (water)	84,000
East Liverpool (sewage)	30,116
Grover Hill (water)	60,000
Highland Heights (water)	34,000
Highland Heights (water)	95,000
Lakeview (sewage)	127,000
Lakeview (water)	29,700
Logan (sewage)	137,570
Middleport (sewage)	150,000
New Vienna (water)	59,367
Perry (water)	161,800
Pioneer (water)	86,000
Pomeroy (sewage)	404,920
Portsmouth (sewage)	503,762
Prospect (sewage)	130,480
Prospect (water)	120,000
Upper Sandusky (sewage)	419,150
Warren (sewage)	209,200
Wilmot (water)	30,000
Oklahoma	
Chandler (water)	57,500
Checotah (sewage)	51,095

ANTHRAFILT
A Filter Medium For All Purposes

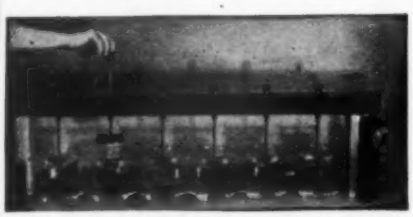
ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York

All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.
822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

THE *Phipps & Bird*
LABORATORY MIXER . . .



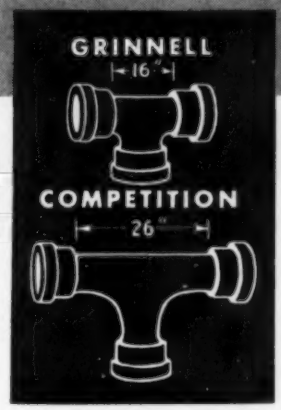
is the important piece of equipment in the Modern Water Works Laboratory Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

Checotah (water)	106,820
Chelsea (sewage)	50,000
Grove (sewage)	70,000
Guymon (sewage)	103,000
Hugo (sewage)	186,300
Mountain View (water)	48,900
Nichols Hills (sewage)	51,45[illegible]
Nowata (water and sewage)	25,800
Pauls Valley (water)	391,470
Perry (sewage)	223,318
Perry (water)	77,010
Temple (water)	71,275
Oregon	
Beaverton (sewage)	232,625
Pennsylvania	
Aliquippa (sewage)	850,000
Allegheny Co. San. Auth. (sewage)	150,000
Ashland (sewage)	290,000
Blakeley (sewage)	260,000
Dickson City (sewage)	51,000
Hamburg (sewage)	591,00[illegible]
Huntingdon (sewage)	590,000
[illegible]	2[illegible],100
Lock Haven (sewage)	412,900
Mechanicsburg (sewage)	142,000
Tyrone (sewage)	342,000
Whitaker (sewage)	38,000
Wilkes-Barre (sewage)	2,898,800
Williamsburg (water)	194,000
South Carolina	
Bowman (water)	44,777
Charleston (water and sewage)	150,00[illegible]
Clinton (sewage)	98,700
Clinton (water)	49,350
Lake City (water)	49,000
Lexington (sewage)	18,300
Marion (sewage)	38,000
Olanta (water)	48,500
Richland Co. (sewage)	60,737
Woodruff (water)	49,683
South Dakota	
Castlewood (sewage)	82,585
Philip (sewage)	120,000
Philip (water)	61,230
Tennessee	
Athens (sewage)	325,000
Bristol (sewage)	897,345
Knoxville (sewage)	2,707,000
Nashville (sewage)	3,189,037
Texas	
Beaumont (sewage)	508,645
Beaumont (sewage)	720,000
Boyd (sewage)	28,000
Burnet (sewage)	24,300
Burnet (sewage)	32,100
Burnet (water)	33,705
Burnet (water)	37,920
Commerce (water)	23,944
Devine (sewage)	68,500
Eden (sewage)	128,800
Emory (sewage)	49,068
Emory (water)	71,914
Fort Worth (sewage)	1,000,000
Jefferson Co. (sewage)	683,500
Jefferson Co. (sewage)	1,126,155
Pasadena (water and sewage)	543,000
Schulenburg (sewage)	35,000
Weatherford (sewage)	82,000
Weatherford (water)	54,500
Whiteface (water)	57,250
Utah	
Elwood (water)	90,000
Heber City (water)	23,300
Price (sewage)	98,490
Vermont	
Canaan (water)	99,300
Virginia	
Elizabeth City Co. (sewage)	26,659
Elizabeth City Co. (sewage)	27,351
Bristol (sewage)	897,375
Warwick Co. (sewage)	47,0[illegible]
Warwick Co. (sewage)	73,110
Warwick Co. (sewage)	95,195
Washington	
Kittitas (sewage)	125,113
Pateros (sewage)	100,871
Toppenish (sewage)	425,000
Union Gap (sewage)	238,245
Waitsburg (water)	15,900
West Virginia	
Sophia (sewage)	110,000
Wisconsin	
Alma Center (sewage)	69,000
Balsam Lake (sewage)	59,000
Centuria (sewage)	89,980
Coleman (sewage)	22,000
Eleva (sewage)	60,000
Eleva (water)	50,000
Fall Creek (water)	65,320
Highland (sewage)	120,000
La Valle (water)	67,610
Lyndon Station (sewage)	42,151
Mauston (sewage)	57,529
Mineral Point (sewage)	115,000
Mineral Point (sewage)	205,200
New Lisbon (sewage)	36,990
Ontario (sewage)	66,900
Ontario (water)	55,000
Plain (sewage)	61,288
Rio (sewage)	80,379
Shorewood (water)	980,000
Waldo (water and sewage)	105,200
Washburn (sewage)	64,400
Wyocena (water)	38,867
Wyoming	
Cheyenne (sewage)	501,000
Jackson (sewage)	158,700

GRINNELL SOCKET FITTINGS

SPACE-SAVING WEIGHT-SAVING DESIGN



TEE

	Grinnell		Competition	
	Weight	Run from bell to bell	Weight	Run from bell to bell
4"	96 lbs.	11 in.	128 lbs.	22 in.
6"	147 lbs.	13½ in.	200 lbs.	24 in.
8"	222 lbs.	16 in.	294 lbs.	26 in.
10"	325 lbs.	19 in.	395 lbs.	28 in.
12"	417 lbs.	21½ in.	512 lbs.	30 in.

AND A COMPLETE LINE

You'll find convenience – and profits, too – in using modern Grinnell Socket Fittings. Compact, they are easier to handle, fit neatly into close quarters, speed installations. Friction loss is not increased. Socket and spigot dimensions and wall thicknesses are same as AWWA standard Class D pipe. Underwriters' Laboratories approved.

Specially coated with coal tar pitch varnish. Bends have lugs to take socket clamps.

Write for catalog: "Water Works Specialties."

GRINNELL COMPANY, INC.
Executive Offices, Providence 1, R. I.
Branch Warehouses in Principal Cities

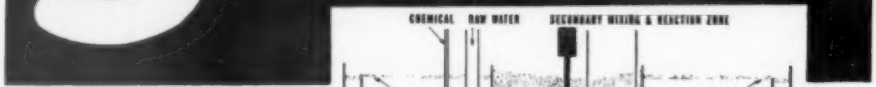
WHENEVER **PIPING** IS INVOLVED

Interstate Sanitation Commission Celebrates 10th Year

The Interstate Sanitation Commission was ten years old in July. Composed of the states of New York, New Jersey and Connecticut, the Commission has been functioning to curb the growing menace of polluted waters adjacent to the New York Metropolitan Area.

The Commission has demonstrated the ability of states to function together in matters of stream pollution abatement without Federal intervention. In these ten years, 25 sewage treatment plants have been constructed within the area over which the Commission has jurisdiction. Bathing has been restored in many places and shellfish raising has returned as an industry. Even the

5 reasons why ACCELATORS cut costs of Water Treatment



Results, with the ACCELATOR, are regularly better than with conventional-type plants for clarifying . . . softening . . . stabilizing. For more details, write for your copy of the *What, How and Why of the Accelator*. INFILCO INC., 325 West 25th Place, Chicago 16, Illinois.

CONSULT INFILCO — FIRST IN WATER AND SEWAGE TREATMENT

Before Cleaning — After Cleaning

The Trade Mark of a Nation-Wide Organization

From Washington, D. C., to the Pacific, North, South, East and West, National Water Main Cleaning experts stand ready to serve you —guaranteeing to restore your mains to 95% of original capacity.

For as many as 40 years—longer than most water works men have been engaged in their professional work, National Water Main Cleaning Company has been building up an organization of engineers trained in the art of rehabilitating water lines.

This "95% performance" is now accomplished more quickly and with less disturbance to your normal operation than was ever possible before.

To put your water distribution system into first class condition for maximum service get in touch with our nearest office.

The National Water Main Cleaning Co.

50 Church St. — **Branches:** — **New York 7**

115 Peterboro St., Boston 15, Mass.
P. O. Box 749, Mayaguez, Puerto Rico
7103 Dale Ave., St. Louis 17, Mo.
3707 Madison St., Kansas City 2, Mo.
3812 Castellar St., Omaha 5, Neb.
P. O. Box 683, Jacksonville 1, Fla.
205 West Wacker Dr., Chicago 6, Ill.
501 Howard St., San Francisco, Cal.
2028 Union Ave., Montreal, Can.
576 Wall Street, Winnipeg, Canada

shad have returned to the Hudson River.

Only 21 orders have been issued in the ten year history of the Commission, and in only two instances was there any forced threat of court action. The Interstate Sanitation Commission has been a model for similar interstate bodies set up to deal with problems on the Delaware, Potomac, and Ohio Rivers.

MANUFACTURERS' and EQUIPMENT NEWS

Builders-Pacific, Inc.

A New Corporation Headed by Lee Chamberlain as President and General Manager.

Builders Iron Foundry of Providence, R. I., announces the formation of a new affiliate, "BUILDERS-PACIFIC, INC.," a California corporation with offices, warehousing and service facilities in San Francisco and Los Angeles. The main office of Builders-Pacific is located at 921 University Avenue, Berkeley, and the Los Angeles office at 2085 Belgrave Avenue, Huntington Park.

Lee H. Chamberlain

Builders-Pacific will represent the following three affiliates of Builders Iron Foundry: Builders-Providence, Inc., manufacturers of Venturi meters and a wide variety of instruments for metering and controlling flow, liquid level, temperature, pressure and weight; The Omega Machine Co., formerly of Kansas City, Mo., makers of a complete line of volumetric and gravimetric feeders widely used in water and sewage

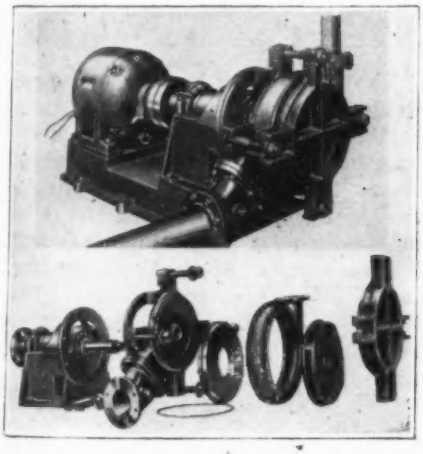
works, power and industrial plants for handling dry materials or the gravity feeding of liquids; and (in Northern California) % Proportioneers, Inc., %, manufacturers of constant rate and flow proportional chemical solution pumps for water and sewage systems, swimming pools and sanitation services.

Builders-Pacific will also represent the Walker Process Equipment, Inc., of Aurora, Ill., manufacturers of a broad line of processing equipment for water, sewage and industrial plants, the Aurora Pump Co., supplying pumps for water and sewage works throughout the State of California, as well as The Ludlow Valve Mfg. Co., of Troy, N. Y.

Lee H. Chamberlain, long active in machinery and equipment sales on the Pacific Coast, is President and General Manager of the new corporation. He will be located in the San Francisco office but will divide his time between that office and Los Angeles. Harold W. Leeson will handle sales and service in the Los Angeles area, and as Service Manager will have charge of maintenance and repair service throughout the State.

New Morris Slurry Pump

A new centrifugal type of slurry pump has been introduced by the Morris Machine Works. This unit handles all types of mixtures of abrasive solids and chemicals in suspension, including acid slurries and



sludges, caustic liquors, milk of lime, soda ash, concentrates, slag, residue from filters, silt, etc. The accompanying photograph shows the pump assembled and dismantled. The ease of dismantling is apparent, only four bolts having to be removed. The pump comes in 2, 3, 4, 5 and 6-in. sizes.

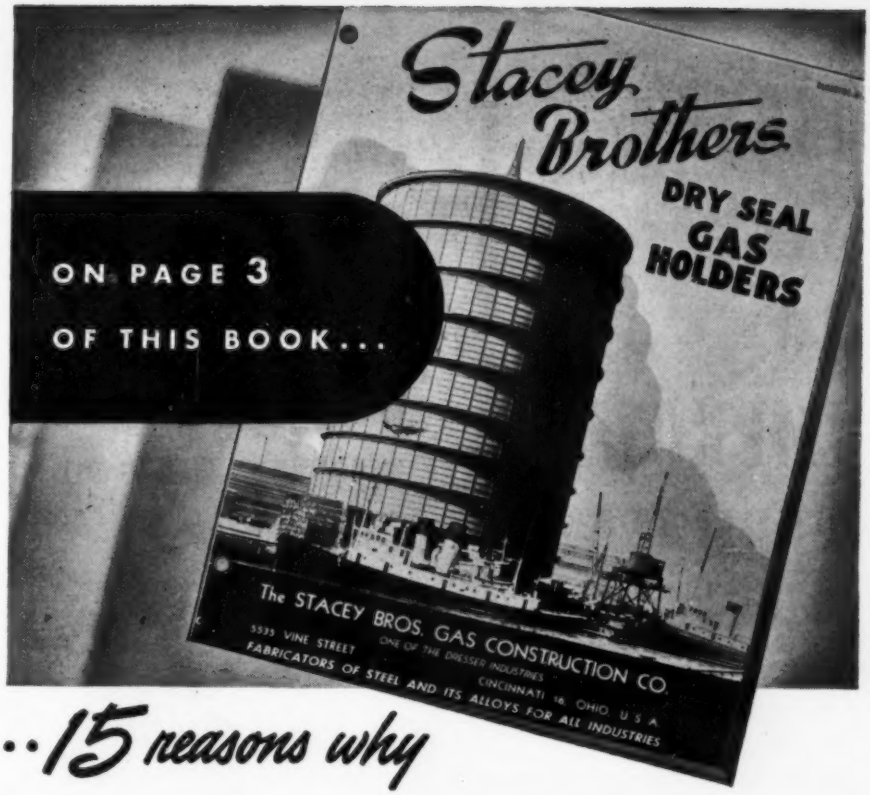
Further information on this new type (Type R) slurry pump may be obtained from the Morris Machine Works, Baldwinsville, N. Y.

Engineer Veterans Rejoin Bailey Meter

Bailey Engineers, recently released from military service, have rejoined the company after having completed a refresher course at the factory in Cleveland. Most of these engineers are now located in the company's branch offices where they will assist power and process engineers in the application of suitable meters and controls for operating problems.

Engineers released from the army have been assigned as follows: J. A. Lucas, Cincinnati office; J. W. Herrington, Atlanta office; J. E. Zummerman, Detroit office; A. L. Danielsen, Denver District; and S. T. Novak to the position of Quality Engineer at the Cleveland factory.

Engineers released from the navy have been assigned as follows: H. R. Jamieson to the Proposition Dept. in Cleveland; H. C. Schink, Boston office; and Vincent Beno to develop-


Stacey Brothers
DRY SEAL GAS HOLDERS
ON PAGE 3
OF THIS BOOK...
The STACEY BROS. GAS CONSTRUCTION CO.
5535 VINE STREET
ONE OF THE DRESSER INDUSTRIES
CINCINNATI 16, OHIO, U.S.A.
FABRICATORS OF STEEL AND ITS ALLOYS FOR ALL INDUSTRIES

..15 reasons why

YOU'LL SAVE ON INSTALLATION, OPERATION, MAINTENANCE WITH STACEY-KLONNE TYPE DRY SEAL GAS HOLDERS . . .

This 32-page book tells the complete construction and operation story of dry seal gas holders, including four pages of valuable engineering data and tables. From detailed drawings and closeup illustrations you'll find why operators are turning to Stacey-Klonne Dry Seal Holders for economical, trouble-free storage capacity.

During the 14 years since we first introduced Stacey-Klonne Holders in this country we've built them as small as 30,000 cubic feet—and as large as 10,000,000 cubic feet. You can benefit by this pioneering experience. Whether you operate holders now—or plan building them in the future, you'll want this book. Write us on your company letterhead for your free copy.

STACEY BROTHERS
GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 VINE STREET, CINCINNATI 16, OHIO

Stacey Brothers
ALL-WELDED GAS HOLDERS

FIRST STEP TO IMPROVED EFFICIENCY

and Reduced Vacuum Filtration Costs.

Ferri-Cl$_3$or
Ferric Chloride
The FAST Coagulant

THE MODERN COAGULANT

FERRIC CHLORIDE

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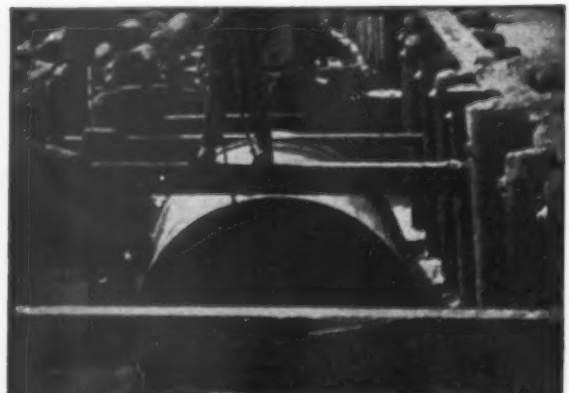
117 LIBERTY STREET • NEW YORK 6, N. Y.
BOSTON • CHICAGO • CINCINNATI • CLEVELAND • GLOVERSVILLE • PHILADELPHIA



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

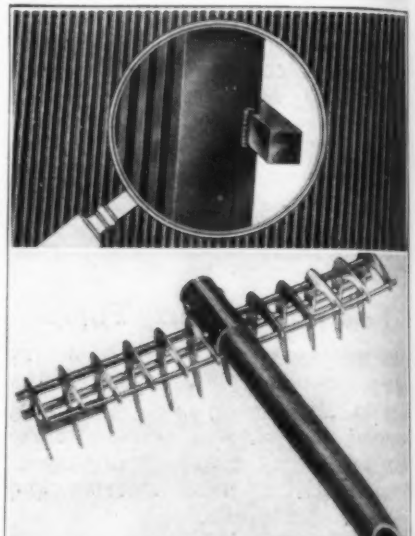
Warren Pipe Company of Mass., Inc.

ment work in the company's Research Department.

Two engineers from the Canadian Army have recently returned to the company's Canadian subsidiary, Bailey Meter Co., Ltd., and after taking the refresher course at Cleveland, resumed their activities in Canada. They are W. L. Thompson, Manager of the Toronto Branch office, and W. A. Nelson of the Canadian Head office at Montreal.

"Power-Saver" Trash Racks and Rakes

The accompanying photographs show the new developments in Trash Racks and Rakes that have been announced by the Rodney Hunt Machine Co.



The new rack has an improved welded back bar construction which surpasses the old spool and rod arrangement and is much easier to clean. The new rake is of stainless steel designed and constructed to be as strong as a single piece of steel. The specially formed basket-type teeth offer greater capacity. The handle is of tubular construction to reduce weight, and produce a buoyant effect that helps lift the rake.

The Power-Saver Racks and Rakes are obtainable in a variety of sizes from Rodney Hunt Machine Co., Orange, Mass.

Byers of Byers Made Ass't Mgr. N. Y. Office

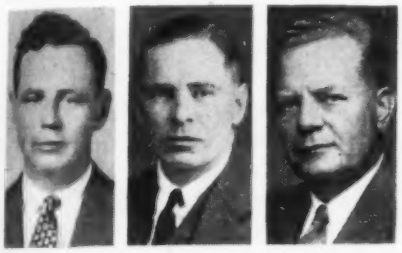
A. M. Byers Co. of "Genuine Wrought Iron" fame, has announced the appointment of Buckley M. Byers

as Ass't Manager of the New York Office. Young Byers, a grandson of the founder of the company, has recently returned from four years' service in the Navy as a Lieutenant. In his new capacity he will have charge of export sales.

Mathieson Creates Four New Sales Posts

Four new sales posts have been created by Mathieson Alkali Works and three sales territories have been rearranged, one in New England and two in the South.

Harold R. Dinges has been named District Sales Manager of one of the new southern sales areas with headquarters in Charlotte, N. C. O. J. Theobald, Jr. will assist Mr. Dinges.



Harold R. Dinges **Fred O. Tilson** **Wm. H. Eastburn**

Fred O. Tilson is the District Manager of the second new area in the South, with headquarters in Chattanooga, Tenn.

William H. Eastburn heads the newly defined New England Territory as District Sales Manager with headquarters in Providence, R. I. Mr. Dinges joined the company in 1941. Tilson and Eastburn have been with the company for upwards of 12 years.

Newman Elected President Ohio Chapter, Am. Soc. of Sanitary Engineering

Leo N. Newman, Vice Pres. and Secy. of the Josam Mfg. Co., Cleveland, Ohio, has recently been elected President of the Ohio Chapter of the Am. Soc. of Sanitary Engineering at its 1946 Annual Meeting in Cleveland, presided over by retiring President Richard Barrett, Chief Plumbing Inspector for the State of Ohio.

President Newman has long been a "wheel-horse" member of the Am. Soc. of San. Engineering, having served as Secretary of the Ohio Chapter and in various other offices.

New Permutit Test Kit for Boiler Water

A boiler testing kit for determining alkalinity, hardness, and chlorides has been developed by the Permutit Co. This new kit contains solutions and precision-made pipette droppers for accurate measurement and comes in a portable white enamel cabinet, 10x10x4¾ in. It can be modified to permit testing for sodium sulfite also.

This new boiler testing kit is available from the Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Liquid Conditioning Announces Dr. Sussman Has Joined Staff as Chief Research Chemist

The recently organized Liquid Conditioning Co. has announced that Dr. Sidney Sussman, formerly Chief Research Chemist for the Permutit Co., has joined the staff of Liquid Conditioning Co. in the capacity of Chief Chemist. At the same time, Mr. Marvin Lane, formerly Research Chemist with Permutit Co., became Asst. Chief Chemist of the new company.

SOLVAY
LIQUID
CHLORINE
Here's the way to keep water SAFE every second of every day!
SOLVAY Liquid Chlorine is the proven way of insuring the safety of every drop of water you deliver every second of the day. Be sure of the safety of your water supply... protect it with SOLVAY Liquid Chlorine treatment. You cannot afford to neglect water safety for a single second. Quick delivery is available from three strategic manufacturing plants—Solvay, N. Y., Hopewell, Va., Baton Rouge, La.
SOLVAY SALES CORPORATION
Alkalies and Chemical Products Manufactured by The Solvay Process Company
40 Rector Street
New York 6, N. Y.

The TATE Cement Lining Process
Restores efficiency of old Water Mains

NOW is the time to investigate the Tate Cement Lining process —and see what it can do to restore the efficiency of your old water mains.

View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Write for Literature.

What the TATE Process accomplishes

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All joints cement-lined . . . just one continuous pipe.
6. Does the job without interruption of service to consumer.

TATE PIPE LININGS, Inc.
ANDOVER, MASS.

Soil Resistivity Meter

With the interest in pipe line protection by cathodic means and damage to pipe wrought by electrolysis and corrosion from soil currents, it is of interest to know that a soil resistivity meter is available to measure the electrical condition of the soil.

This soil resistivity meter, designed to measure up to 30,000 ohms per sec., has a self contained power source, special design probe, and a dial calibrated to read in ohms per cc., although the measurement is of total resistivity. Weighing approximately 19 pounds, with push button control and but one probe, Model 243 reads soil sensitivity within a radius of 12 inches of prod tip inserted to any desired level.

Further information may be obtained from the manufacturer, Associated Research, Inc., 231 S. Green St., Chicago 7, Ill.

Columbia Chemical Purchases Chlorine Plant

The Columbia Chemical Div. of the Pittsburgh Plate Glass Co. has recently purchased a large chlorine and caustic soda producing plant at

PULSAFEEDER

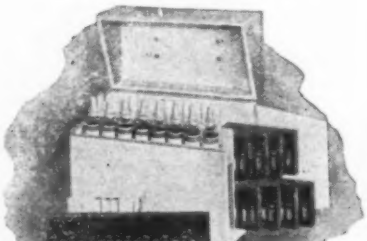
CHEMICAL PROPORTIONING PUMP

- ★ For hypochlorination, ammoniation, and continuous chemical feeding
- ★ Hydraulically-balanced diaphragm head . . . isolates chemical solutions
- ★ Continuously adjustable while in operation
- ★ Sealed-in lubrication . . . long life . . . low maintenance
- ★ Multiple head and flow proportional units

Write for descriptive bulletin No. 242

LAPP INSULATOR CO., INC.
PROCESS EQUIPMENT DIV. LEROY, N. Y.

Control pH...
this easy way!



The Taylor Long Range pH Slide Comparator is completely portable . . . comes in a compact carrying case which holds 3 to 9 color standard slides and all equipment necessary for making accurate determinations quickly and easily. Liquid color standards are enclosed in plastic slides and carry AN UNLIMITED GUARANTEE AGAINST FADING. Complete with 3 color standard slides, Chlorphenol Red, Bromthymol Blue, Cresol Red (pH 5.2 — 8.8) and all accessories . . . $42.00. Extra slides $8.00 each.

See your dealer or write today for 88-page booklet, "Modern pH and Chlorine Control," which outlines the Taylor Liquitrol Method of determination . . . it's free.

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

FINE SCREENS
FOR
SEWAGE
AND
INDUSTRIAL WASTES
TREATMENT

FORMER CONCEPTIONS
COMPLETELY OUTMODED

NO COSTLY, POWER CONSUMING REVOLVING BRUSH ARMS—25% GREATER SUBMERGED AREA.

NEW SCREEN PLATES FOR THE ECONOMICAL USE OF A FILTER MEDIA ON THE SCREEN, THUS INSURING GREATER REMOVALS THAN POSSIBLE HITHERTO.

COMPLETELY AUTOMATIC CONTROL POSITIVE SEAL RINGS.

MODERN DESIGN
HIGHEST EFFICIENCIES
LOWEST COST

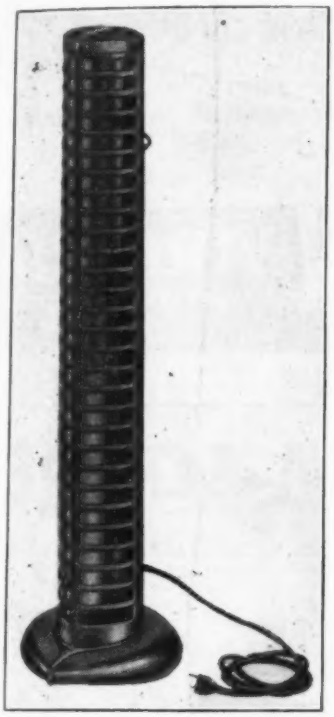
SANEQUIPMENT ENGINEERING
2843 WHITEWOOD AVE.
ANN ARBOR, MICHIGAN

DESIGNERS — CONSULTANTS

Natrium, W. Va. The plant was originally built and operated by the Columbia Chemical Division for the government's Defense Plant Corporation under a contract which included an option to purchase. The plant is located on the Ohio River about 30 miles south of Wheeling, and is one of the largest chlorine producing plants ever built as a single unit.

New Style Electric Heater

A long, slender portable electric heater designed for head to heels warmth has been introduced by the Thermador Electrical Manufacturing Co. Called the Thermador

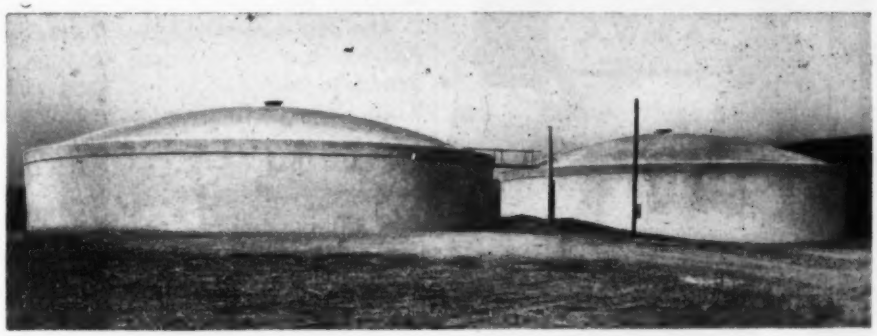


"Longfella," this heater is just over three feet high and stands on a 10-in. sturdy base. Extremely light and portable, the design of this heater permits its use in restricted areas, small rooms, laboratories, offices, pump rooms, where condensation is a problem, etc. This unit requires 1320 watts and 120 v. A.C. or D.C. Further information about the "Longfella" may be obtained by writing the Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles, Calif.

Turco Products Appointments

Turco Products, Inc., of Los Angeles, manufacturers of cleaning and

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



PRE-STRESSED "GUNITE" TANKS

Above are shown two 80' diameter 750,000 gallon prestressed "GUNITE" water storage tanks with "GUNITE" dome roofs. We built these tanks in 1943 for the Borough of Schuylkill Haven, Penna.

Prestressed "GUNITE" produces a water storage tank which is bottle tight and maintenance free. They may be built either at ground level, completely underground with earth covering over the dome roof, or may be in the form of stand-pipes or elevated tanks.

Our experience in this field includes scores of tanks and silos of many types ranging up to two and one-half million gallons capacity.

Our 72 page Bulletin C2300 describes this method of construction fully and also other uses of "GUNITE."

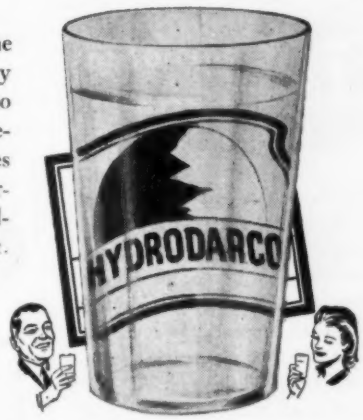
Write for your free copy of Bulletin C2300 today.

MANUFACTURERS OF THE "CEMENT GUN"

It's a Clear and Clean Proposition

GOOD WATER MAKES SATISFIED CUSTOMERS

You can win and hold the good will of your public by standardizing on Hydrodarco for water purification. This special activated carbon eliminates odors and bad-tasting impurities with absolute dependability at surprisingly low cost.



HYDRODARCO

DARCO CORPORATION
60 EAST 42ND ST., NEW YORK 17, N.Y.

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VOGT BROTHERS MFG. CO.
TRAFFIC MODEL
FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO.
LOUISVILLE, KY.
MAIN AT 14th
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VOGT MFG. CO., Incorporated
LOUISVILLE, KY.
P. O. BOX 1122

AERO-MIX

AERATOR—MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.

WRITE FOR INFORMATION

maintenance compounds, has appointed Thomas G. Franzreb to the Technical Service Division Staff. Mr. Franzreb is a graduate of Wagner University in New York City and has studied at Columbia University. He spent two years in the Navy as Materials Laboratory Officer at Jacksonville, Fla.

Also appointed to the Technical Service Staff was Donald Keating, a graduate of U. C. L. A. and Cal. Tech. Mr. Keating also served in the Navy as executive officer on an L. S. T. in the Pacific.

Clayton Manufacturing Appointments

Clayton Manufacturing Co. of Alhambra, Calif., has appointed two new district managers. J. R. "Bob" Carpenter was made district manager of Northern California, Nevada,

J. R. Carpenter

E. J. Baker

and Utah, and Edward J. Baker was appointed district manager in the Great Lakes area with offices in Detroit, Mich.

Mr. Carpenter has been with the company for seven years, serving as a member of the Valve Experimental Research Dept. Mr. Baker is just out of two years' service as a Master Sergeant attached to the Atomic Bomb Development Group.

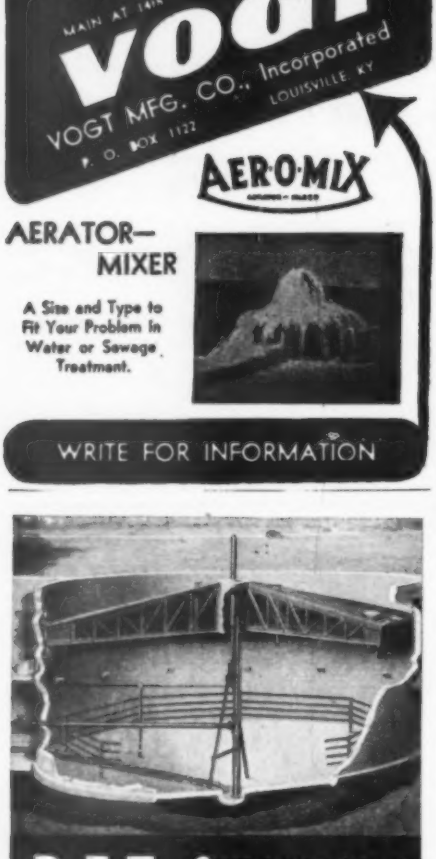
MR. SUPT:—

Sure! You can superchlorinate and avoid high residual chlorine taste when—

you post-treat with Virginia's "ESOTOO".

Write us today.

VIRGINIA SMELTING COMPANY
WEST NORFOLK, VIRGINIA



P.F.T. Supernatant Selector

provides a positive means of selecting and removing the best supernatant liquor from digestion tanks at a slow, continuous rate, regardless of location of supernatant in tank. Vertical slotted tube of selector extends through all zones where strata of supernatant form. Effective capacity of the tank for the reduction of solids is increased. Rate of withdrawal can be controlled within fairly close limits with the P.F.T. Supernatant Gauge, Sight-Glass and Sampler. Ask for Bulletin No. 243.

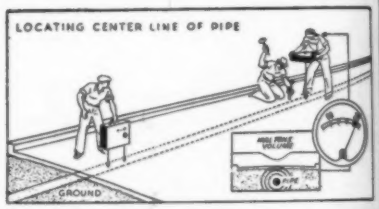
P.F.T. PACIFIC FLUSH TANK CO.
4241 RAVENSWOOD AVE., CHICAGO
NEW YORK • CHARLOTTE, N. C.
SAN FRANCISCO • LOS ANGELES

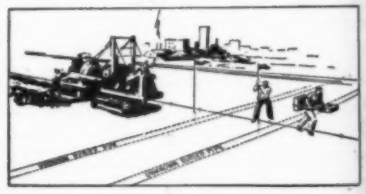
BOND-O
Sulphur Joint Compound

Our BETTER BLENDING means that each batch of BOND-O comes out of our machines exactly compounded and thoroughly mixed. Cast iron pipe joints made with BOND-O show this difference. Less initial leakage from every joint made.

NORTHROP & COMPANY, INC.
50 CHURCH STREET
NEW YORK 7, N. Y.

M-SCOPE





BURIED PIPE AND CABLE FINDER

16 PAGE BOOKLET FREE UPON REQUEST

FISHER RESEARCH LABORATORY
Palo Alto, California

LOW COST
DEMINERALIZED
WATER

WILL REPLACE EXPENSIVE DISTILLED WATER IN THE MAJORITY OF APPLICATIONS

★ Demineralized Water suitable for many requirements demanding distilled water, can now be obtained at a fractional part of the cost of distillation. Belco deliveries are surprisingly rapid.

MODERNIZE YOUR ZEOLITE WATER SOFTENERS

The new Belco zeolite will increase the capacity of industrial softeners up to six times as much. Ideally suited for modernization of present equipment. Belco engineers are always available to help you.

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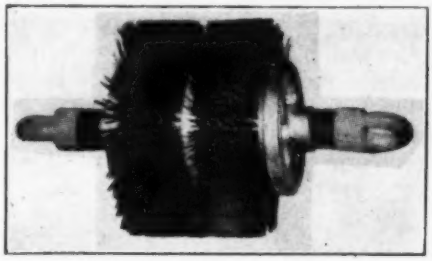
INDUSTRIAL EQUIPMENT
DIVISION
50 IOWA AVENUE
PATERSON 3,
NEW JERSEY

CHECK WITH BELCO...first!

Belco
INDUSTRIAL PROCESSING EQUIPMENT
SINCE 1892

Stewart RB-Line Cleaners

W. H. Stewart Co., Syracuse, has added a new cleaning tool to the company's line of sewer cleaning equipment. These RB-Cleaners are heavily constructed circular brushes



for heavy duty work in water lines, sewers, oil lines, and waste lines of all sorts. The replaceable brush has short flat spring steel bristles, approximately 1½ in. long. These may be obtained in 6, 8, 10, and 12-in. and larger sizes. The larger sizes are assembled with a sleeve between the bristles to prevent tipping in the line.

Further information on these new RB-Line Cleaners may be obtained from W. H. Stewart Co., P. O. Box 767, Syracuse, N. Y.

Penn Salt News

New Adv. Mgr., New Service Pins, New Factory, New Chemical

Recent news releases from the Pennsylvania Salt Manufacturing Co., of Philadelphia, Pa. cover a variety of items. Sidney L. W. Lea, recently released from active duty as an Army Captain, became advertising manager on July 1, and Anne Hurlbrink was named as his assistant. Mr. Lea replaced Mrs. Ethel Serfas Klingman, who is retiring from business and who was presented a 10 year service pin on her departure.

Some thirteen hundred other employees also received the new service pins recognizing five or more years of Pennsalt employment. The awards are gold pins designed from Pennsalt's familiar Keystone symbol, bearing the numerals indicating 5, 10, 15, or 20 years. Twenty-five year employees of whom there are 288, received a pin in which a diamond takes the place of the numerals.

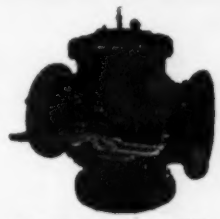
Pennsalt has announced that at Portland, Oregon, it will build the first plant in the far west for producing technical DDT. However, this will be the third DDT unit in the company's facilities.

The company has also announced that fluorine is now available in steel pressure cylinders on a limited commercial scale for experimental use by manufacturers and researchers.

· 1879 ·
ROSS
AUTOMATIC VALVES

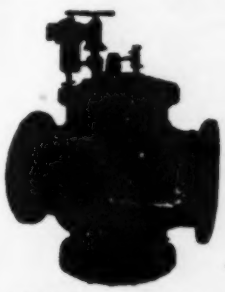
ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES



ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs, hydraulic control.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.
4. Can be equipped with electric and manual controls.

COMBINATION VALVE
This valve will permit flow in one or both directions acting as
1. Pressure Reducing and Relief Valve.
2. Pressure Reducing and Altitude Valve.
3. Relief and Altitude Valve.



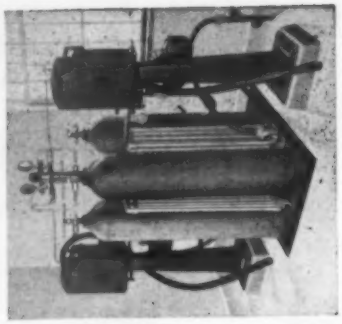
REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

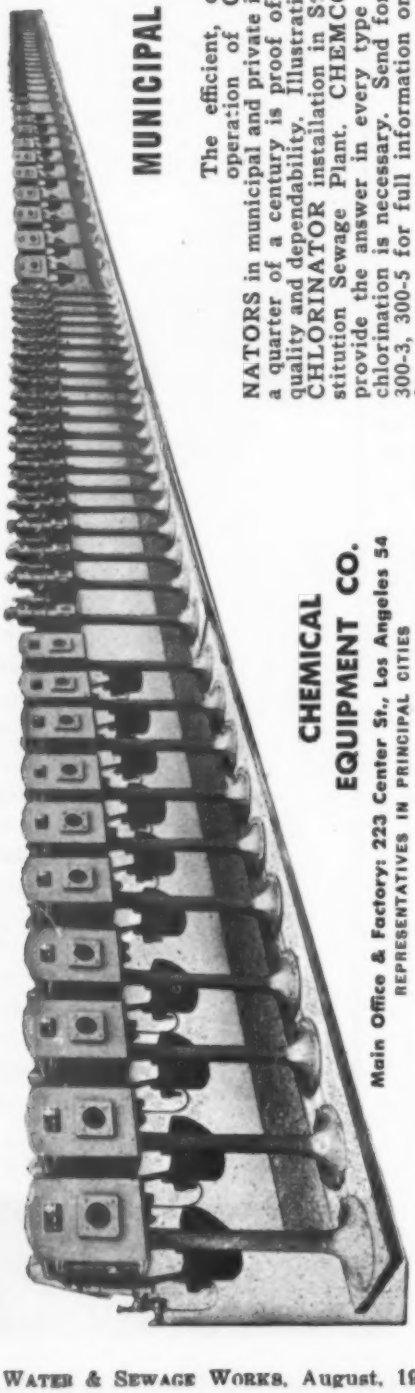
CHEMCO CHLORINATORS

for

MUNICIPAL INSTALLATIONS



The efficient, continuous, automatic operation of CHEMCO CHLORINATORS in municipal and private installations for nearly a quarter of a century is proof of their extremely high quality and dependability. Illustration shows a CHEMCO CHLORINATOR installation in State of New York Institution Sewage Plant. CHEMCO CHLORINATORS provide the answer in every type of installation where chlorination is necessary. Send for bulletins Nos. 300-1, 300-3, 300-5 for full information on exclusive CHEMCO features.



CHEMICAL EQUIPMENT CO.

Main Office & Factory: 223 Center St., Los Angeles 54

REPRESENTATIVES IN PRINCIPAL CITIES

Diamond Alkali to Build 6 Million Dollar Chlorine Plant in Texas

The Diamond Alkali Co. has received approval of the Civilian Production Administration for the construction of a new $5,750,000 electrochemical plant to produce chlorine, caustic soda, and muriatic acid at Houston, Texas. The plant will be located on a 280 acre tract and is expected to be in operation in less than two years.

Portable Electric Hand Lamp

The Big Beam No. 211 portable electric hand lamp weighs only five pounds with batteries, is weatherproof, and throws a beam of localized light for 1500 ft. This light is powered by two standard dry cell

batteries, may be set down anywhere, or clamped in a special hold-down fixture for automobile trunks or prows of boats. The lamp should prove a handy accessory around water and sewage works, and water supply reservoirs.

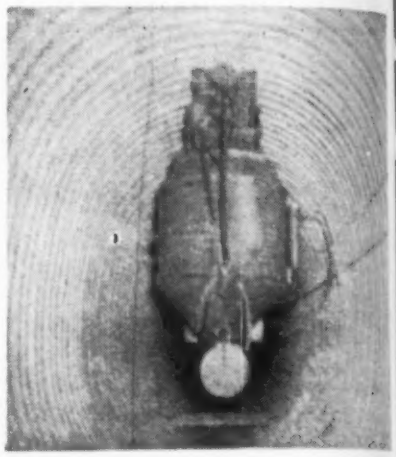
This Big Beam No. 211 is manufactured by the U-C Lite Manuf. Co., 11 E. Hubbard St., Chicago 11, Ill.

American Well Works Appointments

The American Well Works, Aurora, Ill., has announced several recent appointments both in management and technical staff. Alvin Haas has been named Vice-President and General Manager and comes to the company after 15 years as General Manager of the Yates American Machinery Co.

As Chief Engineer of the Sanitary Division, W. N. "Doc" Remsburg has been named. Mr. Remsburg has been

what designed strength can mean to your tunnel liner jobs



Rear view of weighing hopper. This elliptical batching tunnel of No. 10 gage Armco Steel is 11 by 13 feet and 460 feet long. Raw aggregates were stored over a 10-foot tunnel, 260 feet long, and wet sand over an 8-foot tunnel, 190 feet long.

This is how three aggregate tunnels built of ARMCO Corrugated Liner Plates helped speed construction of the Norfork Dam—a 1,500,000 cubic yard job.

First, the plates were easy to handle and install. Then, their designed strength permitted placing the tunnel directly beneath the aggregate pile, which attained a height of 60 feet. Delays caused by freezing in cold weather were avoided because the aggregate was handled from the bottom.

Armco's method of bolted construction made it a simple matter to locate the hoppers at any desired point. When the job was done the ARMCO Liner Plates were removed, nested together and stored in a minimum of space for future use.

There is a type and gage of Armco Plates to meet every tunnel condition. You can order exactly what you need for the job and the chances are you'll be "holing through" ahead of schedule. Write today for information on your specific needs. Armco Drainage & Metal Products, Inc., and Associated Companies, 1365 Curtis St., Middletown, O.

ARMCO

ARMCO

Tunnel Liner Plates

FOR
Accurate Chemical Feeding
PLUS!

ADD-A-FEEDER

VAR-I-FEEDER now does triple or double duty inexpensively by means of exclusive ADD-A-FEEDER. Each ADD-A-FEEDER is an individual VAR-I-FEEDER with rate-of-feed independent for each unit, and all power supplied by original motor. Thus, you can feed several chemicals simultaneously, or increase single chemical capacity.

If you expect to double or triple pumping requirements, or if you foresee the possibility of adding another chemical to the process, buy a Twin or Triplet ADD-A-FEEDER base when you purchase your original VAR-I-FEEDER. If you already have a VAR-I-FEEDER you need only buy the base plate and an ADD-A-FEEDER for your purpose.

Every ADD-A-FEEDER, of course, has the exclusive VAR-I-FEEDER features of hi-speed, tachometer counted injections and easy change-of-feed rate. A turn of the handwheel regulates feed without interrupting processing. In fact, ADD-A-FEEDER is VAR-I-FEEDER without the motor.

Send for booklets VARI and Photo #91.

VAR-I-FEEDER

For Accurate Chemical Feeding,
Chemical Water Treatment,
Chlorine Dioxide Process
For Taste and Odor Control

CHEMICAL FEEDERS DIVISION
MORSE BOULGER DESTRUCTOR COMPANY
1700B 205 E. 42nd St.
NEW YORK 17, N. Y.
Representatives in all principal cities
Equipment Makers and Proportioning Engineers

with the company for the past 12 years. Added to Remsburg's staff is Gerald E. Hauer, formerly with General Chemical Co. for a number of years.

LITERATURE AND CATALOGS

Chemical Feeder Quiz

Leave it to Lindy Harper, Pres. of Omega Machine Co., to get out an unusual piece of advertising and catalog literature. In **Chemical Feeder Quiz,** Lindy has asked all of the questions that any water or sewage works operator might ask about chemical feeders, and he answers them, too. Illustrated with some rather unique drawings, this four page folder, a copy of which we picked up at the AWWA meeting in St. Louis, may be just the thing you are looking for if you want some questions answered about chemical feeders.

Write the Omega Machine Co., 9 Codding St., Providence, R. I., for a copy of this Chemical Feeder Quiz.

Diesel Engines

Not one, but three new bulletins have been issued by the Cooper-Bessemer Corp. on their stationary Type LS Diesel Engine. Bulletin No. L-31 describes the **Type LS Stationary Diesel Engine;** Bull. No. L-32 describes the **Type LS Supercharged Stationary Diesel Engine;** Bull. No. L-51 describes the **Type LS Gas-Diesel Engine.** The Type LS engine is not a new engine, but these bulletins are new and of different style. Only engineering data and facts have been included in these bulletins, and thus a maximum of data and usable information is included in a minimum of space in these four page folders.

Any or all of these bulletins on Diesel engines may be obtained from the Cooper-Bessemer Corp., Mt. Vernon, Ohio.

Diesel Engine Applications

If you want to know about the **Applications and Economics of the Diesel Engine,** then write to the Diesel Engine Mfrs. Assn., 1 N. La Salle St., Chicago 2, Ill., for a copy of the address of Harvey T. Hill,

Eddy
HYDRANT

SIMPLE, EFFICIENT and DURABLE . . .

NO digging; no special wrenches; no water can escape in case of damage to standpipe; stem set at bottom of valve means bending by accident won't hurt it; no freezing due to positive drip action; no complicated mechanism, one man can remove entire valve and stem easily, quickly; no water hammer, valve closes against pressure with cut-off under valve; large waterway; and—every single part made with extreme care to last a lifetime and longer. Choice of many water works men and fire chiefs.

EDDY FOR LONG SERVICE

EDDY VALVE COMPANY
WATERFORD, NEW YORK

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries

ROBERTS FILTER MANUFACTURING COMPANY • Darby, Pa.

AMERICAN GAS BOILERS
STEAM AND WATER TYPES
for Digester Heating
FOR RATINGS AND DATA SEE OUR PAGE IN THE 1946 ANNUAL REFERENCE SECTION
American Radiator & Standard Sanitary Corporation, Pittsburgh 30, Pa.
SALES OFFICES IN PRINCIPAL CITIES
AMERICAN-Standard
HEATING PLUMBING
Serving the Nations' Health and Comfort

for CONCRETE and STEEL!
Inertol Protection Means Lowest Cost Per Year
INERTOL COMPANY, INC. NEWARK 5, NEW JERSEY and SAN FRANCISCO 7, CALIFORNIA

GATE VALVE OPERATION
★ SAFE ★ RELIABLE ★ QUICK ★
By
The Dean Truck Mounted Valve Operator
Write for Literature
PAYNE DEAN & CO. P.O. Box 271 MADISON, CONN.

Exec. Dir. of the Assoc. This address was given at State College, Pa., before college and university instructors in mechanical engineer-

Permutit's Data Book

The **Data Book** published by The Permutit Co. is not a bulletin or catalog equipment. It is as its title implies, a Data Book on a variety of technical subjects encountered by practicing engineers who work with water conditioning problems. Some of the subjects covered are hydraulics, hardness of water, chemical conversions, coagulants, zeolites and their reactions, softening processes, boiler feed, steam, pH, logarithms, and weights and measures. This revised edition of the Data Book has been available for some months, but in case you haven't received a copy, write for one. Address your request to The Permutit Co., 330 W. 42nd St., New York 18, N. Y.

High Pressure Pumps

You can drive **Vertically Split Case High Pressure Pumps** with direct connected motor, small steam turbine, gasoline engine, or chain or belt drive, according to Bulletin No. B-346 of the Economy Pump Co.

This bulletin covers the vertically split-case, multi stage, high pressure pumps designed for use on clear liquids, particularly for general water supply, or for boiler feeding, sprinkling, and other services. These pumps handle quantities of liquid up to 200 psi. and at capacities of from 10 to 75 gpm.

Cat. B-346, titled Vertically Split Case High Pressure Pumps, may be obtained from Economy Pumps, Inc., Hamilton, Ohio.

Transite Sewer Pipe

We think the Johns-Manville bulletin on **Transite Sewer Pipe** was published last November, but for some reason we just came across it recently. If you, like us, haven't yet seen this 18 page bulletin which shows how to use Transite pipe, where to use it, its advantages and its installation, then you should write for a copy.

Address your request to the Johns-Manville Corp., 22 E. 40th St., New York, N. Y.

INSTALLATIONS WORLD WIDE

LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS LATEST "COREY TYPE" HYDRANTS

Write for Catalogue and Information

IOWA VALVE CO.

General Offices:
Hubbell Bldg., Des Moines, Iowa

Plants:
Oskaloosa, Iowa

FOR BETTER

pH Control and WATER TESTS

there is nothing like

NON-FADING GLASS COLOR STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.

WRITE FOR BULLETIN No. 602

HELLIGE

INCORPORATED

3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.

HEADQUARTERS FOR COLORIMETRIC APPARATUS

Automatic Controls

There are a number of places in water and sewage plants where automatic controls are of vital importance. We have no doubt that **Sampsel Automatic Controls** could be used in these locations. These automatic controls are shown and described in a catalog by that name issued by Sampsel Time Control, Inc. Among the controls shown are thermostats for all types of installations, damper controls, warm air limit and fan controls, other limit controls, unit heater controls, attic and window fan controls, stoker fire pilot controls, relay and transformer combinations, and an electric pump switch.

Right now on a hot day in August, we can think of a good place for one of those attic fan controls. Six months from now some of those other controls might be more appropriate in some of the water and sewage works we have visited. And you might look into that electric pump switch; it appears to have applications in which many of you are interested.

Write to Sampsel Time Control, Inc., Spring Valley, Ill., for this bulletin on automatic controls.

Thickeners, Clarifiers, Agitators

In Bull. No. 31-D, the Hardinge Co. of York, Pa., have covered **Thickeners, Clarifiers, and Agitators.** The 16 page catalog illustrates and describes tray thickeners, "Auto-Raise" thickeners, rectangular clarifiers, circular clarifiers, agitators, hydro classifiers, hydro-separators, counter current classifiers, and automatic back wash sand filters.

Bulletin No. 31-D may be obtained from the Hardinge Co., Inc., York, Pa.

Pipe Cleaning

Pipe cleaning could refer to tobacco pipes, water pipes or sewer pipes, but W. H. Stewart's folder, **Here's the Answer to Your Pipe Cleaning Problems,** refers more particularly to cleaning of sewer lines. This four page folder shows various items needed to keep a sewer system in well cleaned order. There are flat steel sewer rods and attaching parts, revolving universal ball roller heads, revolving spear heads, root cutters, collapsible buckets, screws, and spear screws, claws, spears, hoes, etc., etc., etc., and a windlass.

LEADITE

The Pioneer Self-Caulking Material for C.I. Pipe

Leadite is the pioneer melted self-caulking material for c. i. bell and spigot pipe —It has been widely used for over 40 years under most every condition known to water pipe line construction —and, Leadite improves with age.

Long and satisfied users almost everywhere.

THE LEADITE COMPANY

Girard Trust Co. Bldg.

Philadelphia 2, Pa.

No Caulking

for CHLORINE call on JONES

We are now in a position to supply chlorine, in unlimited quantities, for water works, sewage-disposal plants, and other municipal uses. Same high quality we produced to meet exacting Army and Navy specifications during World War II. Chlorine products, liquid, powder, and gas, packed in cylinders, drums, or carboys. Immediate delivery guaranteed in all sizes, from our plants at Indianapolis, Indiana, and Caledonia, New York. Write or wire for information.

JOHN WILEY JONES CO.

Chemical Specialties

124 HARDWOOD AVE.

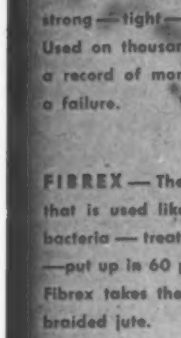
CALEDONIA, N. Y.

HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
New York, N. Y.



DRY BRAIDED
Fibrex

In addition to these items, this folder shows a new brush cleaner, heavily constructed for use in water, sewer, oil or waste lines. These are available in 6, 8, 10 and 12 inches.

This folder on sewer cleaning equipment may be obtained from W. H. Stewart, P. O. Box 767, Syracuse, N. Y.

Two Stage Centrifugal Pumps

Designated as Class GT, the **Two Stage Centrifugal Pumps** described in an Ingersoll-Rand catalog of that title are pumps for general use in a variety of industries and applications. These 2-stage ball-bearing units are designed to operate at modern speeds and are available in capacities up to 2200 gpm. for discharge at heads up to 1050 ft. These pumps shown in this catalog are used in chemical plants, paper mills, packing plants, refineries, breweries, canneries, steel mills, and as dewatering pumps and station pumps. The catalog is well illustrated with cutaway views, types of drive, and typical installations; there are tables of performance, dimensions, and pipe friction.

Persons interested should write for copies of Form 7062, Two Stage Centrifugal Pumps, to Ingersoll-Rand Co. at 11 Broadway, New York 4, N. Y.

GOLDEN-ANDERSON
design and build
over 1500
types and sizes in
automatic
VALVES
for safe protection
on any high pressure
installation

In addition to more than 1500 standard types and sizes of manual or automatic steam and water service valves — GOLDEN-ANDERSON engineers design and build special valves to meet most any difficult high or low pressure service.

Write today for descriptive, technical catalog.

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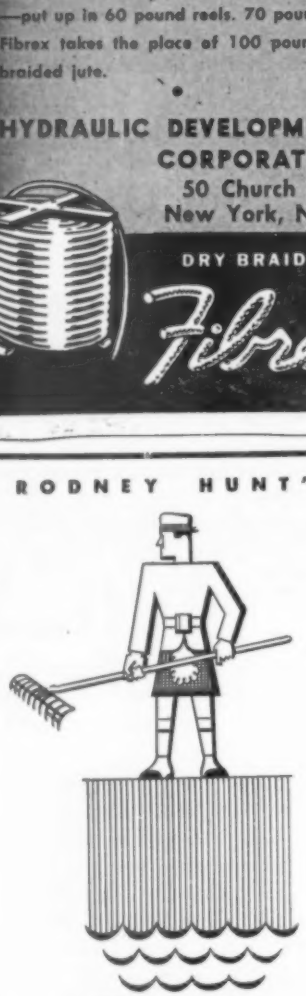
VALVE Specialty Company
PITTSBURGH 22, PA.

RODNEY HUNT'S



"POWER-SAVER"
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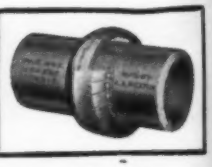

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Electropumps

The Carver Pump Co. has recently issued an eight-page bulletin No. 200, titled Carver Electropumps, in which is described a new line of centrifugal pumps. These new pumps range in capacity from 40 to 900 gpm. and operate at heads up to 200 ft. or higher. The bulletin includes details of the hydraulic design which results in increased efficiencies. Efficiencies of greater than 80 per cent are claimed for pumps of 2½ in. These pumps are available in a choice of enclosures for hazardous locations.

Bulletin No. 200 on Electropumps may be obtained by writing the Carver Pump Co., Muscatine, Iowa.

Paint for Water Tanks

In the No. 1 issue of Vol. 6 of Paint Progress, published by the N. J. Zinc Co., is a story of a new type of paint used to protect the Navy's drinking water. Developed during the war, this protective coating used on the interior of drinking water tanks, is a zinc dust-zinc oxide paint, covered by Navy Specifications 52-P-67. According to the story, this paint has been in service on some vessels for almost two years. Perhaps it may be found of value in the painting of elevated storage tanks. Paint Progress may be obtained from the N. J. Zinc Co., 160 Front St., New York, N. Y.

Bitumastic Protection

So far as we know, these particular bulletins to which we refer are not of recent issue, but if you have a problem on protection of either water works or sewer pipe lines, or water or sewage plant structures and equipment, we suggest that you write to Wailes Dove-Hermiston Corp. of Westfield, N. J., for their folders on *Bitumastic Protection for Water and Sewer Pipe Lines,* and *How to Prevent Deterioration of Sewage Plant Structures and Equipment.*

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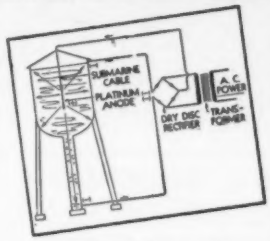

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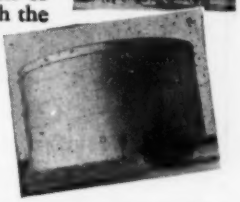

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Index TO ADVERTISERS

Albright & Friel, Inc. 114
Alvord, Burdick & Howson 114
*American Brass Co. 16
*American Radiator & Standard Sanitary 110
*Anthracite Equipment Co. 98
Armco Drainage & Metal Products, Inc. 108
*Atlas Mineral Products Co. of Pa., The 33
Aurora Pump Co. 89

*Bailey Meter Co. 113
Baker, Jr., Michael 114
Belco Industrial Equip. Division....107
Betz, W. H. & L. D....114
Black & Veatch 114
Bogert-Childs 114
Briggs Bitumen Co., W. A. 89
Buck, Seifert & Jost 114
*Builders Iron Foundry 35
*Builders-Providence, Inc. 35
Burns & McDonnell 114
Byers Co., A. M. 15

*Calgon, Inc. 23
Camp, Thos. R. 114
Carborundum Co. 17
Cast Iron Pipe Research Assn. 10-11
Cement Gun Co. 105
Champion Corp. 89
Chapman Valve Co. 44
Chemical Feeders Div. 109
Chemical Equipment Co....108
Chester Engineers, The 114
*Chicago Bridge & Iron Co. 5
*Chicago Pump Co. 87
Clayton Mfg. Co. 94
Collins Engineering Co. 114
Cooper-Bessemer Co. 32

Darco Corp. 105
Dean & Co., Payne 110
Dearborn Chemical Co. 30
De Laval Steam Turbine Co. 37
DeLeuw, Cather & Co. 114
Diamond Alkali Co. 39
Dorr Company, Inc., The ...Third Cover

Eddy Valve Co. 109
Edson Corp., The 113

Fairbanks-Morse 34
Fay, Spofford & Thorndike 114
Fisher Research Laboratory 106
*Flexible Sewer Rod Equipment Co... 38
*Flexible Underground Pipe Cleaning Co. 38
Ford Meter Box Co. 97
Foxboro Co. 42
Fulton, Edw. A. 114

Gannett, Fleming, Cordy & Carpenter, Inc. 114
General Chemical Co. 26
General Electric Co. 24-25
General Paint Corp. 96
Gilbert Associates, Inc. 114
Glace, I. M. 114
Glauber Brass Mfg. Co. 95
Goff, Wm. A. 114
*Golden-Anderson Valve Spec. Co.....112
Gorman-Rupp Co. 22
Greeley & Hansen 114
Grinnell Co., Inc. 99

Havens & Emerson 114
Hayden, Harding & Buchanan.....114
Haydock, Chas. 115
Hellige, Inc. 111
Hil., Hubbell & Co. 96
Homelite Co. 28
Hydraulic Development Corp. 112

Inertol Co. 110
*Infilco, Inc. 100
*Innis-Speiden & Co. 102
Iowa Valve Co. 111

*Johns-Manville 13
Johnston & Jennings Co., The 113
Jones & Henry 115
Jones Co., John Wiley 111

Knowles, Inc., Morris 115

Lapp Insulator Co. 104
Layne & Bowler, Inc. 116
Leadite Co., The 111
Leupold & Stevens 94
Lock Joint Pipe Co. 41
Lozier, Inc., Wm. S. ....
Lumenite Electronic Co. ....

Mathews Hydrants ....
Mathieson Alkali Wks., Inc. ....
Metcalf & Eddy ....
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War Assets Administration ....
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*Advertisers with * were represented in the April, 1946, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

...111
...88
...24
...4
...112
...96
...112
...109
...115
...41
...52
...116
...46
...116
...112
...6
...104
...110
...90
...112
...115
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...80
...21
...58
...80
...115
...4
...111
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...97
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...97
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...27
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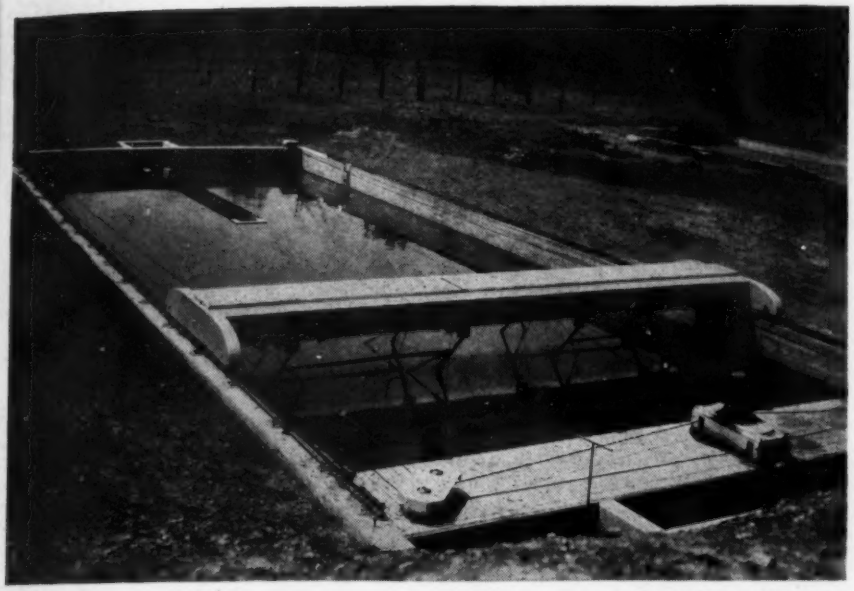
IF *rectangular sedimentation basins are a* "MUST"

CHECK THE DORRCO MONORAKE



Dorrco Monorake at Conway, Arkansas • Consulting Engineer: M. Z. Bair, Little Rock, Ark.

When space and existing structures permit only the use of long, narrow tanks—when old, plain, rectangular sedimentation basins are mechanized – then a reliable rectilinear sludge collecting mechanism is clearly indicated.

Frankly, we always have and always will believe the advantages lie with round or square tanks – centrally fed and peripherally overflowed. But one can't fit a round or square peg into a long narrow slot. Hence the Dorrco Monorake – an improved mechanism for rectangular settling tanks, where this shape is designed-in as a "must".

A balanced raking mechanism, alternating in the raking and idling positions, is supported and operated from a slowly traveling carriage, mounted on rails. Influent at one end—overflow at the other—sludge collection in a deep hopper.

Dorrco Monorakes possess many new advantages cited at the left. They are not subject to many limitations inherent in conventional designs.

More than 60 installations over a period of 12 years have given the Dorrco Monorake a performance record that can be relied upon. Check the Dorrco Monorake before you specify.

ADVANTAGES

Lengths – Any length you choose – no upper limits.

Widths – Up to 3 or 4 times normal.
Up to 40 ft. widths, I-beam design carriage.
Up to 80 ft. widths, truss-design carriage.

Few Submerged Bearings – Minimum of bearings and metal to metal wearing parts below the water level.

Single Hoppers – Blade construction generally permits use of only one hopper for sludge collection.

Long Life Without Repair – Several in operation for 4 years with no replacement of parts.

Skimming – Skimmer can be supplied to skim longitudinally toward effluent end.

Single Drive for Multiple Units – Under certain conditions it is feasible to drive two or more Monorakes from a single motor-drive unit.

1663

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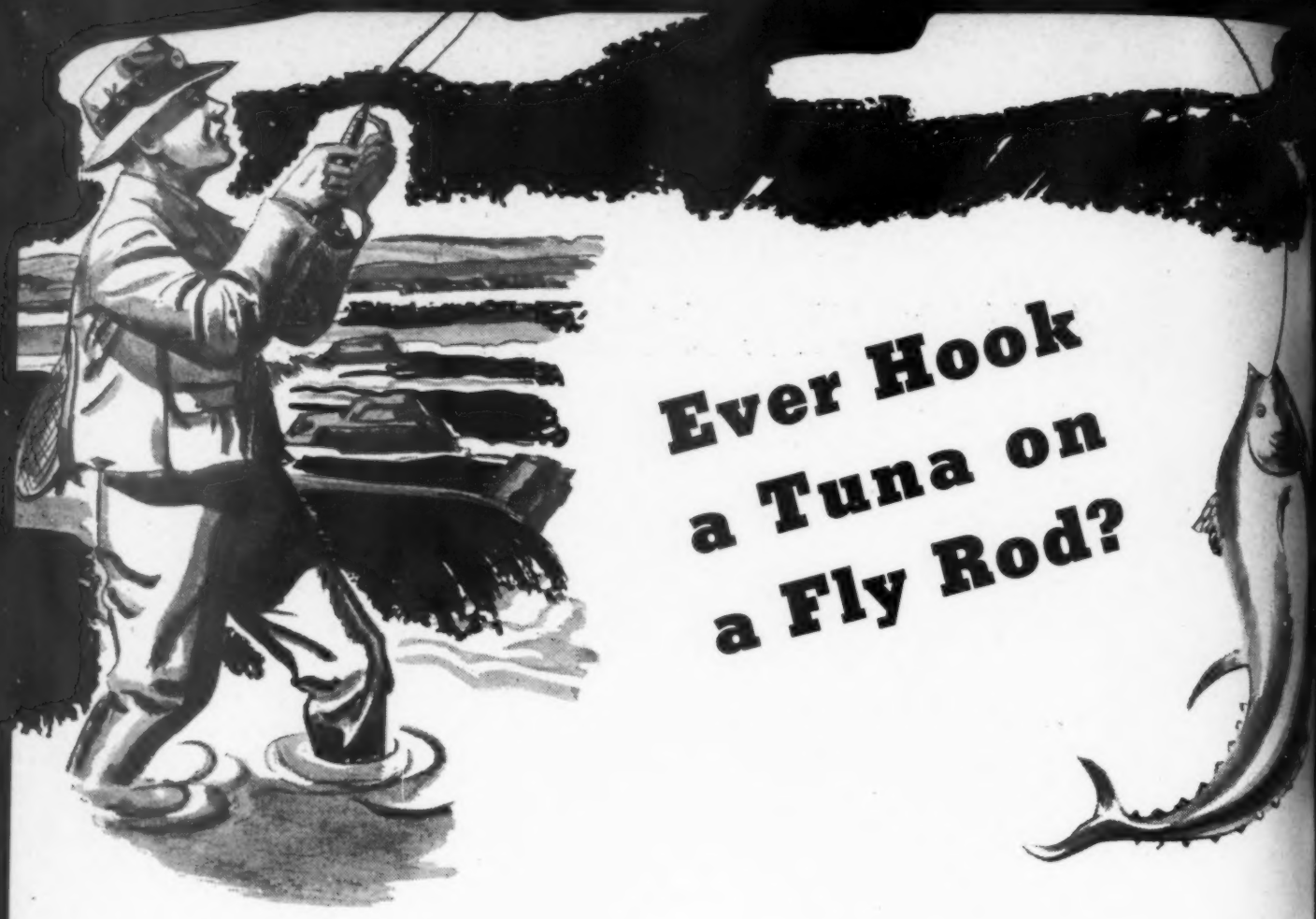


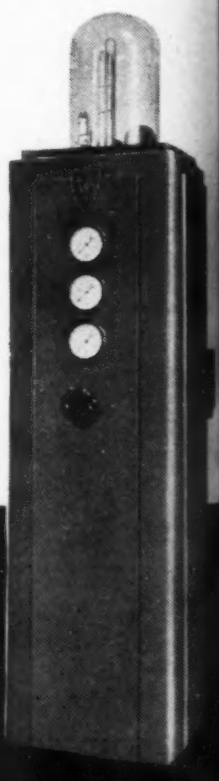
Ever Hook a Tuna on a Fly Rod?

Landing a tuna with a fly rod is no more impossible than expecting a sewage plant designed today to be adequate for the future without chlorination.

Stream control is becoming more and more strict – industries and recreation areas are demanding an end to the pollution of water supplies by unchlorinated effluent – and the man on the street is rapidly losing patience with summer sewage plant odors which proper chlorination would control. Yet these demands of progress need hold no danger for the sewage plant which includes adequate chlorination in its design.

W & T Visible Vacuum Chlorinators are the safety valves which help meet the changes of the future and in many cases increase the effective plant capacity without the need for major alterations.

In existing plants, too, adequate chlorination is a tool of many uses in odor control, effluent sterilization, prevention of filter ponding and sludge bulking, grease removal and many other phases of plant operation.



"The Only Safe Sewage is a Sterilized Sewage"

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